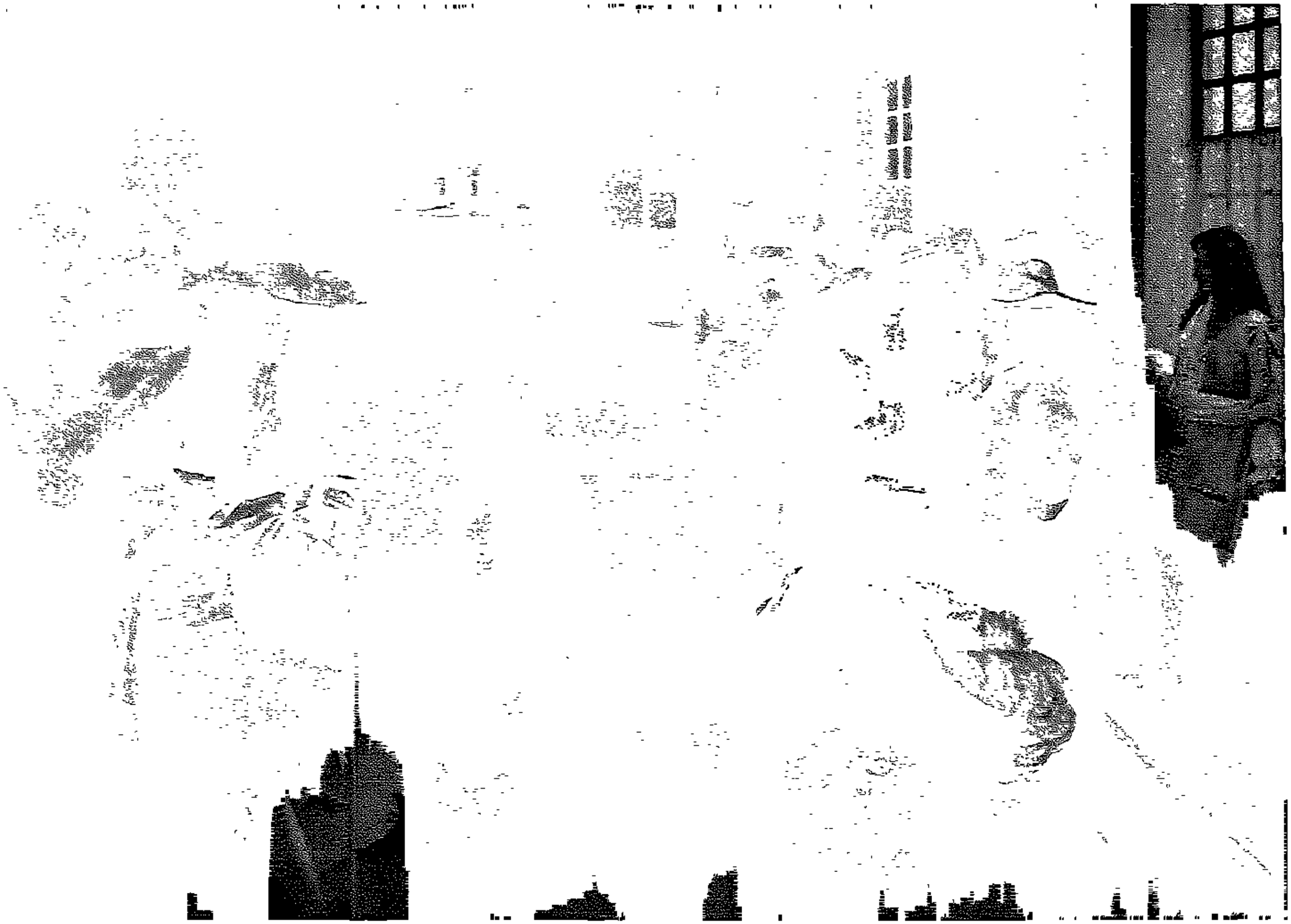
THE PRACTICAL JUNIOR TEACHER



By courtesy of The Hudson's Bay Company, Ltd.

THE FIRST SALE OF FURS AT GARRAWAY'S COFFEE-HOUSE, LONDON, 1671

(Note the Candle, used for Auctions in those days as the hammer is to-day)

(E.3663)

Frontispiece

THE PRACTICAL JUNIOR TEACHER

A Guide to the Most Modern Methods of Teaching Children in the Junior Schools

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Edited by F. F. POTTER, C.B.E., M.A., B.Sc.
Lately Director of Education for the County of Cheshire; formerly H.M. Inspector of Schools
Author of "Common-sense English," Common-sense Arithmetic," etc.

Associate Editor: G. M. PLACE

Contributions by Leading Authorities in Every Branch of Junior Education, with Numerous Illustrations, Schemes of Work, and Practical Suggestions

VOLUME II

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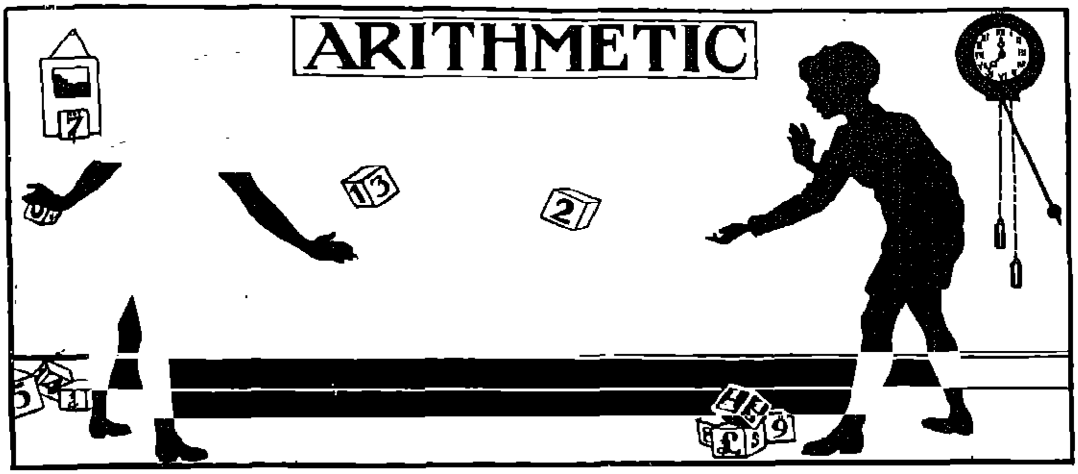


ARITHMETIC

NUMERATION AND NOTATION—THE SIMPLE RULES—PROBLEMS

> *"It is essential that the fundamental processes of arithmetic shall become automatic before the child leaves the primary school. . . . The problems . . . should be quite simple, involving not more than two or three steps in the argument and no large numbers, and they should be related to the ordinary transactions of daily life."*—REPORT ON THE PRIMARY SCHOOL, 1931.

THE less academic programme of to-day should mean more real achievement, but staffs of interconnected Primary and Secondary Schools must have periodic discussions of methods and syllabuses.

It is a striking tribute to the methods now followed in the modern Infants' Schools that Numeration and Notation, as separate subjects of instruction, seldom need any direct treatment in our Junior Schools to-day. We do not expect in pupils from Infants' Schools familiarity with tables and the more formal methods of calculation, and it is fair to say that generally these pupils have mastered numeration and notation to the useful extent of being able to read, write, and interpret simple numbers, consisting of tens and units, even of hundreds, tens, and units.

This easy interpretation of numbers consisting of two or three digits is gained in modern Infants' Schools by a delightful variety of methods. Class activities, group instruction, individual instruction, games, objects, and apparatus, all play important parts. "Counting" shades imperceptibly into groupings, and counting-names are interpreted as objects and groups. Quantity and magnitude thus become as real and as important as counting-names and units. And all the time the group "ten" is the central group round which all the other groups circulate. Separate numbers will be analysed and synthesized, but in the end it is their relation to "ten" which is important. Thus, in oral addition many, if not most, teachers proceed "through the ten," while important exercises in subtraction will consist of "making up the ten." As soon as "ten" and the method of writing it are grasped some teachers proceed to the intensive examination of eleven, twelve, thirteen, etc., while others proceed to deal with twenty, thirty, forty, etc. The exact order in which these two aspects are taken is not perhaps of major importance, but what is of real importance is that the pupil should grasp quite clearly the exact meaning of a number of two figures, "tens" and "units," or "tens" and "ones" as some would prefer.

In the Junior School this incidental treatment of numeration and notation begun in the Infants' School should continue, and "activities," such as work with classroom "shops," give it reality. The wisest course is to avoid large, meaningless numbers, and to begin with simple numbers consisting of one or two digits, extending these to three or more as the pupil progresses.

The Simple Rules

It is generally recognized that at the Junior stage, roughly between the ages seven and eleven, every normal pupil should master the ordinary methods of calculation employed in everyday life. Accordingly the pupil must be taught to add, subtract, multiply, and divide simple numbers with rapidity and accuracy. Indeed, some would affirm that the degree of accuracy should, by constant practice, be largely *automatic*, and such teachers would accordingly emphasize the more mechanical side of the work, while others would prefer that "intelligence" should be mingled with mechanical calculation, since ability to *apply* a calculation is more important than uninspired mechanical accuracy. Amid such a confusion of counsel the conscientious teacher is sometimes perplexed, and is inclined to retort quite fairly that children differ widely in mathematical ability and that while some never seem to advance beyond the stage of unintelligent mechanical accuracy, painfully and laboriously acquired, others treat "problems" with the contempt which comes from a ready apprehension, though they frequently fail to perform accurately the more laborious part of the problem, viz. the calculation upon which the actual answer depends. In dealing with all "rules," however, the approach should be as informal as possible; no slavish adherence to any logical development should be attempted at the Junior stage.

Addition

This is the basis of all Junior Arithmetic, and is indeed the process most commonly used in later life by the average person. The ordinary steps will consist of proceeding from the earliest method of adding by units or ones, i.e. by laborious "counting" methods, to the ready and rapid addition by groups. There is no royal road to this desirable goal. Constant oral practice, together with the forbidding of "counting" methods (using fingers, dots, strokes, objects, and such like), should eventually produce that rapid intuitive addition which we so much desire. It is, unfortunately, true that even to-day many adults are addicted to these clumsy "counting" methods in addition, and may be seen tapping away with pencil and paper or with fingers on table or forehead. It is possible that all such adults are the victims of the bad old method when written "sums" were set at the earliest possible moment, and time which should have been spent at more interesting and effective oral work in addition was devoted to the addition on slates of huge meaningless numbers, every possible device for ensuring dull mechanical accuracy being employed.

Now this desirable habit of rapid intuitive addition is not attained all at once. Rather, it is to be acquired by continuous and varied oral practice. At first most pupils will inevitably, and rightly, proceed "through the ten." Thus the addition of 7 and 5 will be performed in two steps: i.e. (i) 7 and 3 are 10, (ii) 10 and 2 are 12. Endless devices are now employed to give varied and rapid practice in this all-essential subject of *oral* addition. In the first place, ample practice in "group" addition should be given. Thus the pupils should be able to continue the series 2, 4, 6, 8, etc., or 1, 3, 5, 7, etc., as far as desired. This may later be reversed to give practice in regular subtractions: i.e. the pupils should be able to continue a *descending* series such as 50, 48, 46, 44, etc., or 49, 47, 45, 43, etc. These group exercises may be extended to "threes," "fours," "sixes," and later to "sevens," "eights" and "nines." They form the best possible application of addition in the construction of the tables, and many teachers would base all the earlier work in tables on this process of equal additions.

This group-practice may be extended to *alternate* groups. Thus pupils may practice the addition alternately of 2 and 3 as in the series 2, 4, 7, 9, 12, 14, etc.

For miscellaneous unequal additions, a series of simple numbers may be dictated, the addition being performed mentally by the class, or the old device of pointing to figures, arranged generally in a ring, may be used.

Again, oral practice in complementary addition (really subtraction) may be given in the form, "What will make 7 up to 10?" or "What will make 16 up to 20?" or "What will make 85 up to 100?". This useful type may be varied indefinitely according to the age and ability of the children.

Lastly, practice may be given in the *mental* addition of two numbers such as 27 and 16. Here the solution depends upon the addition of the "ten" first, and the steps accordingly are 27, *and ten*, 37, *and six*, 43. It is remarkable to note what proficiency in addition may be attained by constant practice of this kind.

Formal Addition Sums

If these are not begun too soon and are prefaced by ample oral work, half the difficulties disappear. The only new feature which distinguishes formal *written* addition from *oral* addition is the figure or figures which have to be "carried" from one column to the next. But it is important to remember that *vertical* addition is not the only kind of addition which should receive attention, and that those useful composite sums requiring the addition of both rows and columns should be introduced.

Subtraction

From addition to subtraction ought to be a simple and complementary step. Unfortunately, the introduction too early of formal methods and large numbers has caused the subject of subtraction to be regarded with dread by many conscientious teachers, while exponents of "method" still quarrel heatedly over the best method of teaching subtraction.

In this connection the words of the latest official *Handbook of Suggestions* (1947 Edition) may be quoted—

> (*a*) The weight of evidence suggests that accurate subtraction is best attained by the method of equal addition.
>
> (*b*) It is often contended that the child should learn *these rules intelligently* . . . *If this means that he* should grasp the full logic of, say, the subtraction rule at the age when it is commonly learned, it is certainly untrue."

It may further be stated that the method of "equal additions" advocated above by a cautious Ministry of Education is the nearest approach to the natural adult attitude of regarding subtraction as inverse or complementary addition.

Finally, it should be remembered that it is as easy to *teach* the method of "equal additions" as to teach the method of "decomposition," and accordingly it would be better for the pupil in the end if no attempt was made by the Infants' teacher to teach or "explain" subtraction by the method of "decomposition," and if the Junior teacher concentrated on the method of "equal additions."

Multiplication

Success in this process depends upon a ready and accurate knowledge of the "Tables." It has already been indicated in this chapter that these tables may be "built up" by the method of equal addition, as in the series: 2, 4, 6, 8, 10, etc., or 3, 6, 9, 12, 15, etc., and children should, at the appropriate time, "build up" all new tables in this way. All this work, however, is preliminary to the hard grind of *memorizing* the results so that they may be reproduced automatically, almost instantaneously, without thought, for tables once understood must be *learnt*, and learnt by *heart*. Further, they must be emphasized by constant and miscellaneous practice, so that in the end the pupil may give readily and accurately such a product as 7 × 9, or the factors of 35.

Assuming this proficiency in tables, the formal multiplication sum presents no difficulties except that of the figure to be "carried." For many years, in cases where the multiplier consists of two or more figures, it has been customary to teach the pupil to begin by using the *right-hand* figure, a "units" figure, of the multiplier, and to continue working from the right. Thus the example 789 × 234 would be set out in the following form—

$$\begin{array}{r} 789 \\ 234 \\ \hline 3156 \\ 2367 \\ 1578 \\ \hline 184626 \\ \hline \end{array}$$

The latest *Handbook of Suggestions*, however, contains the following important statement—

> It is now generally accepted that the best method in long multiplication is to begin with the left hand digit of the multiplier.

In the light of this advice the above example would be set out as follows—

$$\begin{array}{r} 789 \\ 234 \\ \hline 1578\dot{0}\dot{0} \\ 2367\dot{0} \\ 3156 \\ \hline 184626 \\ \hline\hline \end{array}$$

The dotted cyphers, $\dot{0}$, may be used at first but should be discarded later.

It is to be noted that this method gives in the first line of working a rough approximation of the final result.

In addition to the general and formal methods outlined above, it is important, particularly in multiplication, that *short methods* should be used wherever possible. Thus the pupil should be familiar with the usual short methods for multiplying by 99, or 999, etc., and by 25, and 125 (see page 302).

Division

This process, especially Long Division, is usually placed last in the series of "Simple Rules." This is logically correct since the process is a combination of the other three rules with multiplication and subtraction of special importance in the calculation. It is customary to regard the subject of Division from two aspects known technically as Quotition and Partition. Thus the simple example 95 ÷ 6 may be regarded as either—

(*a*) How many sixes are there in 95? (Quotition.)

(*b*) What is one sixth part of 95? (Partition.)

The two questions do not give quite the same answers. Thus the answer to (*a*) is 15 and 5 over, while the answer to (*b*) is 15⅚.

These aspects of division have long been known to teachers under the terms "Measuring" and "Sharing," and, while they are of less importance in dealing with pure number, they become of very great importance in dealing with division of money or concrete quantities.

So far as Simple Division is concerned, it is the process known as Long Division which is the most troublesome for both teacher and pupil. So difficult has it proved in the past that it is now customary to delay its teaching until very near the end of the Junior period, for certainly to attempt to teach such a process too soon is to court disaster. Various devices are used to lighten the labour of teaching. Thus some teachers require the pupils to construct first a table of multiples of the divisor from 2 up to 9. This being done, the rest of the work is easy, the only drawback being that the whole of the multiples are seldom required in any one example. Again, many teachers now require the pupils to place the quotient figures in their correct position *over* the dividend, and not, as formerly, to the right of the dividend. But when every known device for determining the value and position of the quotient figure has been employed, the process remains extraordinarily difficult at the Junior stage, and it is accordingly doubtful whether before the age of eleven it is worth the amount of time and energy expended upon it, and whether the Junior teacher should not courageously pass on *some* of the pupils at "Eleven Plus" to his Secondary colleagues with the remark "Ignorant of Long Division."

Multiplication and Division by Factors

It was formerly customary to devote considerable attention to the subjects of multiplication and division by factors, especially division "with remainder," but it is now recognized that these processes are not frequently required in later life, and accordingly less time is now spent upon them. They may, of course, be introduced to the more advanced pupils if time permits, but for the average pupil it will be sufficient if ordinary long multiplication and long division are thoroughly mastered.

Problems in the Simple Rules

It remains for us only to discuss briefly the possibility of problems in connection with the Simple Rules. While it is recognized that the basis of all calculations, however "concrete" the units employed, is pure number and nothing else, it is fair to state that problems in pure number make less appeal to Junior pupils than problems based on units of a more concrete nature. We may illustrate this by a problem of the following nature—

What number divided by 7 will give the answer 12 and 6 over?

This is pure multiplication and addition in disguise, and as such is a legitimate problem. The same problem will, however, make infinitely greater appeal if cast in more concrete form as follows—

How many apples will be needed to give 7 boys 12 each, with 6 over (or 12 boys 7 each with 6 over)?

This indicates the first essential of a "number" problem, viz. that it should be in as concrete form as possible, and should refer to subject-matter within the pupils' experience. The second essential is that, if it is to be a *real* problem to the pupil, the method of solution must not be immediately obvious. The difference between a problem and a calculation is precisely this: that in a calculation the process or "rule" to be applied is obvious, whereas in a problem the process to be applied is *not* obvious to the pupil, but is a matter of careful judgment and selection.

It is for this reason that problems should seldom be explained or taught as "types." It is but human for harassed teachers to prefer problems arranged in this orderly manner, so that the pupil may be told to go on without too much supervision, but, while apparent progress may be slower, real progress will in the end be much greater where the pupil is compelled to puzzle out for himself the solution of a problem which does not conform to a recognized type. Usually, however, a patient teacher may unobtrusively hint at a method of solution by suggesting a "mental" example of the same kind.

It will be seen from the above that problems, especially problems in number, unlike the "rules" already discussed, are not suited for class-instruction, but are entirely individual in their appeal. It follows that a copious supply of such problems should be at the disposal of every teacher. Ideally such problems should be suggested by each individual teacher or pupil as the occasion arises, but with large classes some form of class-book of examples is necessary. Fortunately, these class-books to-day are many and excellent. Gone, happily, are the days when teacher and class had to depend upon the woefully insufficient number of "problems" printed upon a number of well-thumbed "cards." To-day the only difficulty is that of choice of class-book and the selection of examples from the class-book in use; but, assuming that this difficulty is satisfactorily overcome, it only remains to state that, so far as the simple rules are concerned, all that is necessary is regular practice at applications and "problems" as varied as possible, together with regular mechanical drill, "oral" and "written," at the fundamental rules. Thus only shall we ensure that our Junior pupils enter the new Secondary Schools at 11+ able to perform simple numerical calculations with speed and accuracy, and to apply these rules intelligently and readily to "problems" within the range of their experience.

SOME GRADED EXERCISES IN NUMBER

Mental: Answers only to be Written

Pupils aged 7+8

1. From one hundred take sixty-five.
2 How many boys can have 6 nuts each out of 96?
3. What is one half of 36?
4. Out of 2 dozen eggs, 3 were bad. How many were good?
5. What must I take from 50 to leave 30?
6. Find half the sum of 25 and 35
7. How many hours are there in 3 days of 24 hours each?
8. Out of 20 sheep 2 died and 12 were sold How many were left?
9 How many half-dozens are there in 4½ doz.?
10 What number divided by 6 will give the answer 5 and remainder 4?

Pupils aged 8–9

1. Find 3 times the sum of 7 and 8.
2. How many times is 12 contained in 156?
3. Add together 3 score and 3 dozen.
4. A man was 40 years old in 1931. When was he born?
5. Out of 9 dozen eggs, 58 were sold. How many were left?
6. 91 boys were arranged in groups of 7. How many groups?
7. Write the next three numbers in the line 7, 11, 15, . . .
8. The middle chapter in a book was chapter 5. What was the last chapter?
9. How far will a man travel in 3½ hours at 20 miles an hour?
10. Add together the numbers between 10 and 20 which divide exactly by 6.

Pupils aged 9–10

1. A boy was born in 1939. How old was he in 1941?
2. What is the difference between 5 score and 5 dozen?
3. What must I take from 1,000 to leave 750?
4. How far would a motorist travel in 2½ hours at 24 miles an hour?
5. What is the largest number of two figures which will divide exactly by 7?
6. Out of 6½ dozen newspapers a man sold 70. How many had he left?
7. The middle chapter in a book is Chapter 7. How many chapters are there altogether?
8. Posts are placed round a square field so that there are 10 posts along each side. How many posts altogether?
9. What number divided by 15 will have the answer 3 and remainder 5?
10. Divide 275 by 25.

Pupils aged 10–11

1. If I write the word *successive* 17 times, how many times shall I write the letter *s*?
2. How many score are there in 340?
3. What must I add to 765 to make 1,000?
4. Multiply 24 by 25.
5. Divide 390 by 13.
6. A man walked up a hill in 28 minutes and down again in half the time. How long did he take altogether?
7. January has 31 days. What is the middle day of January?
8. What number is half the sum of 37 and 73?
9. Find 7 × 13 and so find the remainder when 100 is divided by 13.
10. A boy multiplied a number by 4 instead of dividing by 4. His answer was 96. What was the right answer?

Written Exercises

Pupils aged 7–8

1. From one hundred and seven take forty-nine.
2. Tom had 21 marbles and Dick had 13. How many must Tom give Dick so that both have the same number?
3. Add together the odd numbers between 14 and 20.
4. How far would a train travel in 1½ hours at 48 miles per hour?
5. What number taken away from 100 will leave 46?
6. A boy divided a number by 2 instead of multiplying by 2. His answer was 9. What was the right answer?

Pupils aged 8–9

1. Add together one thousand and nine, one hundred and nine, and nineteen.
2. John and Tom shared 40 apples but John had 10 more than Tom. How many had each?
3. A boy added 27 to a number instead of subtracting it. His answer was 60. What was the right answer?
4. Multiply 47 by 99, using a short method, and then find from your answer the answer to 46 × 99.
5. What is the largest number of two figures which will divide exactly by 7?
6. John had 49 marbles. He lost 17 and then won 32 and 7. How many had he then?

Pupils aged 9–10

1. What number must be added to 137 to make 250?
2. In a division sum the divisor is 27, the quotient 18, and the remainder 9. What is the dividend?
3. Add together the numbers between 20 and 60 which divide exactly by 13.
4. The sum of two numbers is 96, which is 4 times their difference. What are they?
5. Use a short method to multiply 127 by 99. Then use your answer to find the answer to 128 × 99.
6. A boy multiplied a number by 7 instead of dividing it by 7. His answer was 196. What was the right answer?

Pupils aged 10–11

1. The product of 27 and 25 is 675. Use this to find the answer to: (*a*) 27 × 26, and (*b*) 37 × 25.
2. In a division sum the divisor was 37, the quotient 27, and the remainder 17. What was the dividend?
3. The sum of two numbers is 2,137, but one is 139 more than the other. What are the numbers?
4. At the beginning of a motor tour the mileage recorder showed 1,347 miles. Readings at the end of the next 4 days were 1,431, 1,529, 1,636 and 1,748. What was each day's run and the total length of the run?
5. Add together the prime numbers between 120 and 140.
6. What is the largest number consisting of three figures which will divide exactly by 15?

The above indicate progress with pupils having early facility in number work. It is better to work to a less ambitious programme if necessary, and use easier numbers, than to jeopardize the pupil's real progress. Time spent on activities with a post office, grocer's, greengrocer's, toy, and other shops in the classroom is worth while if carefully planned; but able children will enjoy working to their full capacity.

MENTAL WORK

UNLESS we use slide-rules, or other mechanical calculating devices, all arithmetical processes are *mental*, whether the working of the sum is recorded on paper or not. But it is usual to restrict the term "Mental Arithmetic" to that portion of the subject in which the pupil is asked to give the answer only, without setting down his method of working the sum; and it is in this sense that the term is here used.

The Importance of Mental Arithmetic

Arithmetic is rightly considered to be one of the most important subjects taught in our Junior Schools, for no child can proceed very far in the ordinary affairs of life without having recourse to it in some form or other. Arithmetic also is the basic subject of mathematics, which in turn is the basis of all the physical sciences. Mental arithmetic can form the most useful approach to the more formal arithmetic, hence its importance in the Junior School.

The utility of systematic exercises in mental arithmetic can hardly be overstated. By them we may fix the fundamentals of arithmetic, introduce new principles and practices, revise former work, and maintain close contact with any class of children for whose training in arithmetic we may be responsible.

Mental Arithmetic is Pure Arithmetic

It was customary in the past for children to have arithmetic lessons which, though lasting for an hour or more, permitted the working of but three or four long sums. Only a small portion of the time was spent on purely arithmetical processes, for the larger part of the lesson consisted of setting down the working, writing out statements, or ruling lines. These things are necessary to a degree, for they help the child to form habits of tidiness and orderliness which will be of use to him; but the ruling of lines is not arithmetic. It is rather applied art, and it should not take up the major part of the time assigned to the arithmetic lesson.

It may be fairly argued that the main purpose of working a sum is to arrive at the correct answer as speedily as possible, and all methods in arithmetic are good methods in so far as they have this purpose. It is true that teachers like their pupils to set out their work with legible figures and neat arrangement, and, where a sum has involved a train of reasoning, the teacher looks for a logical sequence in the working. But all this figuring, neatness, and logical arrangement is but a means to an end, and not an end in itself. It is only subservient to the chief thing for which the teacher of arithmetic is striving. He wants *accuracy* before all things. He wants his scholars to get their sums right, and he wants this done with the minimum expenditure of time and energy. Mental arithmetic, if properly conducted, can help the teacher to secure his main object, for it will allow the greatest amount of arithmetic to be done in a given time. The children will concentrate all their mental powers upon the arithmetic, and will not be concerned with extraneous processes.

Introducing New Work

There is only one way of learning arithmetic, and that is by working sums. The arithmetical processes tend to become clearer the more we use them, and the reason for doing a sum in a particular way is not always apparent until many such sums have been worked. When a new rule or method in arithmetic has to be taught it is usual for the teacher to give his pupils a large number of oral examples before they attempt the more formal written work. Let us suppose the children are just learning about decimals, and the teacher wishes to introduce the application of the four rules to decimal quantities. He would be wise not to labour the explanation that decimals are tenths, hundredths, thousandths, etc., but after a very brief introductory talk he should let his class become familiar with decimals, by allowing them to work for themselves many very simple examples, such as the following.

Write the answers only to these questions—

$\cdot 1 + \cdot 2$, $\cdot 2 + \cdot 3$, $\cdot 1 + \cdot 7$, $\cdot 8 + \cdot 1$, etc.
$\cdot 2 - \cdot 1$, $\cdot 3 - \cdot 1$, $\cdot 4 - \cdot 2$, $\cdot 9 - \cdot 5$, etc.
$\cdot 1 \times 2$, $\cdot 1 \times 4$, $\cdot 1 \times 5$, $\cdot 2 \times 3$, etc.
$\cdot 6 \div 2$, $\cdot 6 \div 3$, $\cdot 6 \div 6$, $\cdot 8 \div 4$, etc.

In this way numerous little decimal sums can be accurately worked by the beginner. At first the unfamiliar decimal point may confuse him, but when he has worked a score or more of these little sums he will find out for himself that he can do the same things with decimals as with whole numbers. The terror of the decimal point will disappear, and the child will not feel that he must always convert decimals to vulgar fractions before he adds or subtracts them.

Or suppose we take this sum: *What must be added to* 119 *to make* 287? Many children meeting with this type of problem for the first time, and seeing the word *added*, immediately conclude that they are requested to *add* the two numbers. But if many similar problems, set with very simple numbers, are first worked mentally by them, there is a good prospect of their finding out for themselves that this is a subtraction sum.

Compare this problem, *What is the smallest number which must be taken from one thousand to make it exactly divisible by nineteen?* with *What is the smallest number which must be taken from* 13 *to make it exactly divisible by* 4*?* There is precisely the same reasoning to be done in each case, but a child who has never encountered this type of question before will find the reasoning easier in the second case than in the first. This is because the bigger numbers and the harder calculation tend to distract his attention from the reasoning processes.

But once he has grasped the essential relationship underlying the problem, he can give all his mental powers to the mechanical work it involves. The easiest way to make him understand the problem is to allow him to solve many very simple problems of a similar nature by mental arithmetic. It is a valuable practice to teach a child to substitute simple numbers for those which he finds in a difficult problem, for then the problem can usually be worked "in the head" and the reasoning it involves becomes clearer.

Use for Revision Purposes

The pupil's accuracy in arithmetic ultimately depends upon a sound knowledge of tables. When he comes to deal with problems, he will be constantly at fault unless his mechanical work is on a sure basis, and if he has to stop to think out "how many sevens make fifty-six," or "how many yards make a mile," he will be severely handicapped when using such material.

Constant revision of multiplication tables, weights and measures, etc., is absolutely necessary to ensure an automatic knowledge of them. Revision of back work, too, is perhaps more essential in arithmetic than in any other subject, for all fresh work in arithmetic must be built up on work that has been previously learnt.

This revision of tables and of former work may be easily and speedily carried out if a few minutes are devoted daily to exercises in mental arithmetic. Some of the questions set in each exercise should consist of those given on previous occasions. Past questions may be varied slightly, though it is often quite useful to give them in their original form, especially if many of the children found difficulty with them when first presented. Children, in common with adults, like to be given something which they think they can do, and it must be very discouraging to them if they are always faced with fresh difficulties and never have an opportunity to display their knowledge.

Mental arithmetic, therefore, should look both forward and backward. It should prepare the pupil for fresh work, and it should also provide means whereby he revises and consolidates what he has already learnt.

The Collective Appeal

There is another aspect of mental arithmetic which has not always received the attention which it deserves, and that is its collective appeal. These are days when the child is considered as an individual and not as a mere member of a group or class. This is a step in the right direction, for every one who has to deal with children knows that their minds are as different as their faces. Arithmetic is a subject which lends itself to individual methods of instruction, for children's rates of progress in arithmetic vary considerably. But in our enthusiasm for individual work we must not forget that a child is a gregarious animal, and that between the ages of 7 and 15 the herd instinct is very strong in him. A wise educationist never represses a necessary instinct, but allows its free expression and then diverts its energy into socially useful channels.

Mental arithmetic is a *class* method rather than an individual one, and it has its place among methods because of its collective appeal. Children will often make greater efforts when working in a group than when working by themselves, and carefully devised questions in mental arithmetic will evoke a good deal of emotional response in a class of young children. They can easily be made enthusiastic over it, and will clamour for it. The secret of its popularity lies partly in its social nature. If the questions are not too difficult at first, the child finds that he can do them, and with this knowledge of his power comes the desire to exercise it and to display it before others.

It is even possible, if one so desires, to employ the team or house system when working exercises in mental arithmetic. If the marks obtained by members of a team are totalled and compared with those obtained by other teams, it will be found that children often put out far greater efforts to obtain marks for their team than they would otherwise do. Such team work is very useful in a class when enthusiasm for arithmetic is not very marked.

How to Use Mental Arithmetic to its Best Advantage

From the lowest class to the highest, from the first week of the term to the last, mental arithmetic should be regular and systematic. Short periods of ten minutes daily should be given to this subject to ensure the best results. The work requires a good deal of concentration on the part of the children, and, consequently, lengthy periods of time for such lessons are undesirable.

Mental arithmetic will not be systematic unless the questions to be asked have been carefully prepared or selected by the teacher previous to the lesson. It is not a good plan to ask questions haphazard, for if the teacher relies upon what comes into his head on the spur of the moment he will often repeat himself, and waste much time by over-emphasizing certain things and forgetting others.

1. *A Suggested Scheme*

If the teacher has no mental arithmetic book which has been specially arranged for use in conjunction with the class textbook (e.g. *Mental and Intelligence Tests in Common-Sense Arithmetic*—Pitman), he will be well advised to compile a series of exercises which will embrace the whole of the term's work. Most textbooks contain examples suitable for oral or mental work, and these may well form the basis of his scheme. Each exercise should contain *ten* questions, and for a term's work about twenty such exercises would be required. The questions in any one exercise should not be all of the same type, but should contain past, present, and future work. They may, with advantage, be arranged to a plan (see "Typical Exercises," p. 301). The compilation of such exercises may entail a good deal of preparatory work on the part of the teacher, but when once finished the exercises will be of use for many years, and will so materially assist the children that he will be amply repaid for his pains.

Not only should there be a definite scheme of questions for mental arithmetic, but there should be also a definite method of giving the lesson. If the same plan is always adopted, the children will know exactly what is expected of them and, in consequence, much time and trouble will be saved. The plan here suggested has been found by experience to work very well. Each child prepares a slip of paper with the numbers from 1 to 10 down the left-hand side, and opposite these numbers the child writes merely the answers to the questions he is asked. The questions may be written on the blackboard, or dictated. The second method is preferable, since it saves the teachers' time and labour, and gives the children valuable training in listening and responding. Written answers are better than oral ones, for the written answer necessitates work from each member of the class, and allows a just estimation of that work to be made and records of each child's performance to be kept. Further details concerning the dictation and correction of the exercises will be given later, but the whole of the mental arithmetic lesson, if conducted according to the scheme here suggested need not take more than ten minutes.

(a) The Questions

Questions in mental arithmetic should be *simple, brief,* and *unambiguous.*

It sometimes happens that children develop a strong dislike for mental arithmetic because the questions which have been set them were much too difficult. Constant failure has led to confusion, discouragement, and consequent lack of effort. It is preferable to set mental arithmetic questions which are too easy rather than too hard. Encourage the children to get high marks in these exercises rather than let them think you are merely trying to catch them. Let the pupils feel their superiority in this kind of work, rather than their inferiority. Once a child gets it into his head that he cannot do sums without using pencil and paper, the teacher's task becomes a very difficult one; but let the pupil think from the first that he can do well at mental arithmetic, and he will go on trying, even though the exercises become more and more difficult. Thus will be set up a circle of effort—a healthy circle, not a vicious one: the child will like mental arithmetic because he always does well at it, and he will always do well at it because he likes it.

It must also be remembered that dictated sums are more difficult than written ones. It is much easier, for example, to take two from two thousand when we are confronted with the actual figures. We want our pupils to learn to work with numbers without having to write them first on paper, because most of the arithmetic of our everyday life has to be done in this way. Dictated questions, therefore, should be kept fairly simple until our children are accustomed to working with numbers which they must visualize without writing down.

About half the questions in the exercise should be of a simple mechanical nature, and if a class average of 6 out of 10 is not obtained in any exercise, the exercise is probably too hard, and should be simplified. It is also of interest to the teacher to note which questions in any exercise give most trouble to the class. At least one question in each exercise should be of a difficult or unfamiliar nature, so that the more brilliant members of the class may have a chance. In setting the questions we must think of the clever children as well as the dullards.

Questions should be *brief*, otherwise they will not be suitable for dictation. The mental span for all of us is very limited, and the normal child's mind cannot hold many ideas in consciousness at one time. Moreover, we want, in this lesson, to secure the maximum of arithmetic in the time at our disposal. Such a question as the following is not suitable for mental arithmetic because of its wordiness and elaboration.

In a greengrocer's shop I buy some fruit and vegetables, the total cost of which is 1s. 10½d., and at the butcher's I buy a mutton chop for which I pay 7½d. How much have I spent altogether by making these purchases?

The same amount of arithmetic could be obtained by saying "Add 1s. 10½d. to 7½d."; and the child's mind will be concerned merely with computation, and not troubled by images of mutton chops, peas, and potatoes.

Finally, the questions set should be *unambiguous*. There should be only one possible answer, and that answer should generally consist of one word or one number.

Such a question as "How long is 72 in.?" should be avoided, for its answer may be expressed accurately in at least three ways, viz. 72 in., 6 ft., or 2 yd. It is better to ask "How many yards in 72 in.?" for this can have one answer only.

(b) The Dictation of the Exercises

It is a very good plan to adopt a set method of dictating the questions, and the method here suggested has justified its adoption. When the class have prepared their papers and are ready to work the sums, the ten selected questions are dictated very quietly and clearly at a constant rate of four a minute. No question is

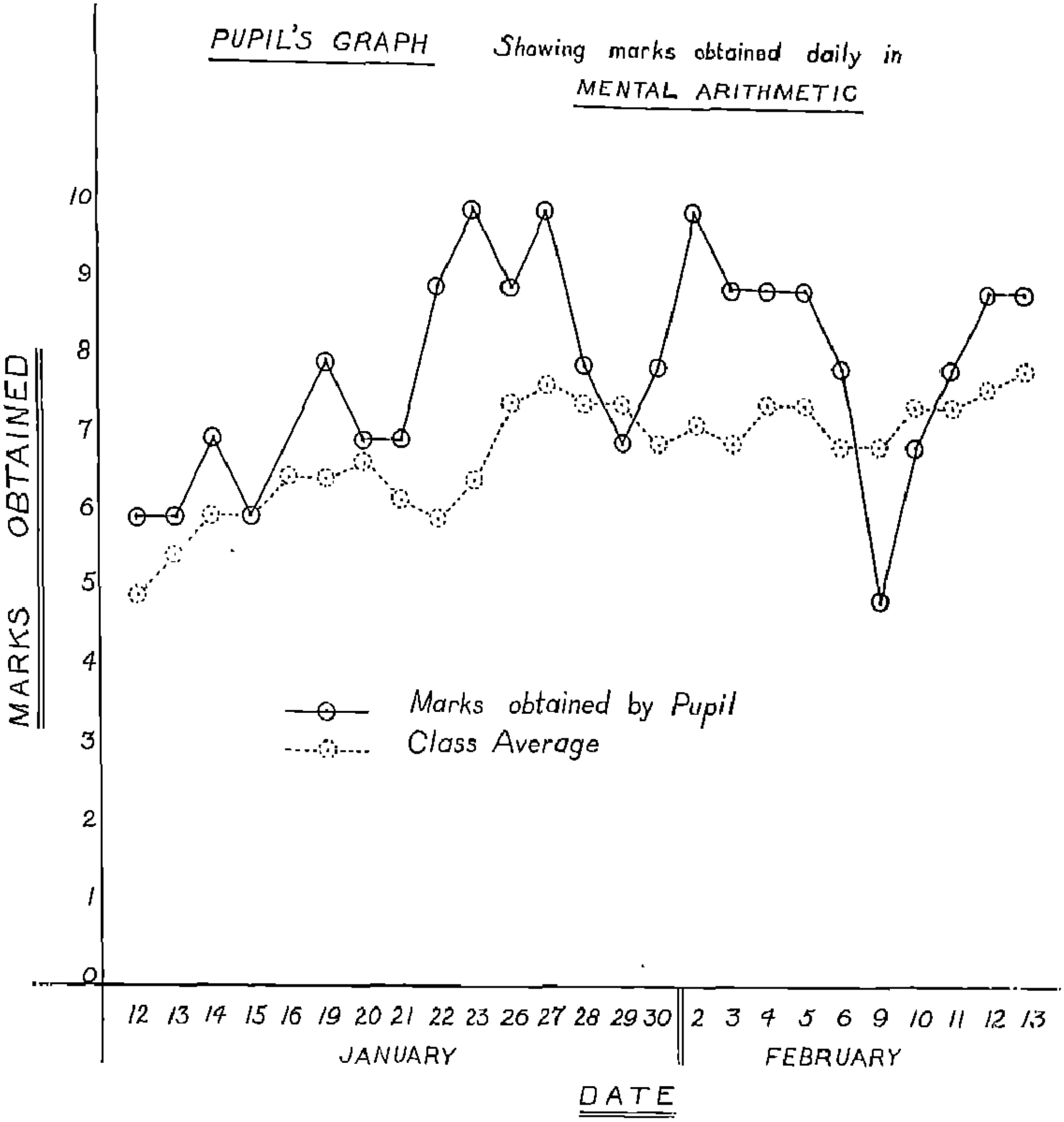


Fig. 1

Pupil's Graph of Marks Gained

repeated, for the children have been previously instructed that, if they do not hear the question or cannot answer it, they are to put a cross on their paper opposite its number, and then keep their minds alert for the next question. It may require a certain amount of hardness of heart on the part of the teacher to dictate in this way, but once the children have become used to this procedure the dictation proceeds smoothly and quickly, and the children do much better work than they would do under other conditions.

(*c*) *The Marking and Correction of the Exercises*

Immediately the dictation is completed the children should change papers one with another, according to an accustomed plan, and the teacher should read out the answers only. The children mark each other's papers, and return them to their owners. The teacher then dictates once again the question and its answer, and while doing so he gives any comments or advice that he thinks necessary. The children meanwhile can check the marking of their papers, find out their mistakes, and learn from the teacher the best method of tackling the question should it arise again.

A record of the marks obtained by each child should be kept both by the teacher and by the child himself. The child's individual record may help him considerably, and the teacher's record will indicate how the class as a whole is working. A graphical representation of these records has been found most stimulating both to the class and to individual children.

It is a useful device to give the same exercise again after a few weeks, when the children will have forgotten the exact wording of the questions. The results obtained can be compared with those of the previous occasion, and the teacher will have definite data for estimating the progress of his class.

2. *Useful Types of Questions for Mental Arithmetic*

Mental arithmetic readily lends itself to the arithmetic of everyday life, and the little sums which confront us daily should figure largely in these exercises. Problems concerned with shopping, the giving of change, approximations, sharing equally and proportionately, the prices of dozens, scores, and so on, should occur regularly in all mental arithmetic.

Exercises in mechanical addition, subtraction, multiplication, and division should be frequently given, and so also should questions dealing with weights and measures, the calendar, and the clock. In the Junior School, too, we should introduce rules for divisibility, prime numbers, factors, simple, vulgar, and decimal fractions, the mensuration of the rectangle, the triangle, and the cube, and easy sums with averages and percentages.

Such questions are to be found in all modern arithmetic class-books. The following types of questions, however, are less common in the textbooks, but they have been found useful in the mental arithmetic lesson. Three sums of each type are given, but the teacher will easily be able to devise others of a similar nature should he consider them suitable for his purpose.

1. Write in figures—
   (*a*) one hundred and thirteen;
   (*b*) twelve hundred and four;
   (*c*) ten million, two hundred and ten.
2. Write in words the numbers made by—
   (*a*) one followed by two noughts;
   (*b*) three followed by four noughts,
   (*c*) six ones written in succession.
3. How many noughts in the number—
   (*a*) one thousand?
   (*b*) ten thousand and ten?
   (*c*) twenty million?
4. Which of the following numbers is prime—
   (*a*) 2, 4, 6?
   (*b*) 6, 7, 8?
   (*c*) 21, 22, 23?
5. Which is bigger—
   (*a*) one thousand and one, or ten hundred?
   (*b*) twelve hundred, or one thousand?
   (*c*) two hundred thousand, or half a million?
6. Find the sum of the digits composing the number—
   (*a*) three hundred and thirty;
   (*b*) two thousand and sixteen;
   (*c*) one million and eighty.

7. Is the following number exactly divisible by 3 (or by 9)?—
    (*a*) three hundred and thirty;
    (*b*) two thousand and sixteen;
    (*c*) one million and eighty.
8. Write in a short form—
    (*a*) ten times ten (10^2);
    (*b*) $6 \times 6 \times 6$ (6^3);
    (*c*) two multiplied by itself twice (2^3).
9. Write the next higher number of the series—
    (*a*) 8, 10, 12;
    (*b*) 24, 32, 40;
    (*c*) 3½, 5, 6½.
10. Write the next lower number of the series—
    (*a*) 96, 84, 72;
    (*b*) 6, 3, 1½;
    (*c*) 1, ·1, ·01.

Some Typical Exercises

All the questions in one exercise should not be of the same type, but should vary so as to introduce more interest into the lesson, and allow a wider range of the work. If the variation follows a set plan the teacher will be sure to cover the whole of his syllabus, and to make a thorough revision of the previous work.

Here is a plan upon which it is suggested that the exercises might be arranged.

Question	*Kind of Sum*
1.	Numeration.
2.	Mechanical addition or subtraction (revision).
3.	Present class work.
4.	Money tables (revision).
5.	Problem (revision).
6.	Present class work.
7.	Weights and measures, clock, and calendar (revision).
8.	Money sum.
9.	Mechanical multiplication or division (revision).
10.	Harder problem.

As an illustration of the kind of questions which it is suggested might prove most useful for the mental arithmetic lesson, four typical exercises (one for each year) are appended. None of these exercises should take more than three minutes to dictate.

Exercise 1 (For Children of 8 Years)

1. Write in figures the number five hundred and fifteen.
2. What is 7 plus 8 plus 0?
3. How many is ¾ of a dozen?
4. How many farthings are worth 2½d.?
5. Write the sign which means "take away."
6. How many ounces of sweets will weigh ¼ lb.?
7. How many minutes are there in an hour?
8. What must be added to 7d. to make 1s. 0d.?
9. Multiply 3 by 12.
10. If two cats have two kittens each, how many animals altogether?

Exercise 2 (For Children of 9 Years)

1. How many hundreds in two thousand?
2. Add 4 to the difference between 9 and 6.
3. How many whole ones in fifteen halves?
4. How many children could receive 6d. each if 6s. were given away?
5. If a foot is longer than a yard write letter A, if not write B.
6. How many days from noon on Sunday till noon on Monday?
7. Express ¾ of a ton in cwt.
8. Add together a half-crown and half a guinea.
9. What is one-fifth of thirty?
10. I have 4 pennies in one pocket and 10 in another. How many must I take from one pocket and put into the other so that there may be the same number in each?

Exercise 3 (For Children of 10 Years)

1. Is the product of any two even numbers odd or even?
2. Add ½ to ⅙, and give the answer in lowest terms.
3. Find the L.C.M. of 2 and 4.
4. What fraction of £1 is 5s.?
5. How many numbers are there from 12 to 20 inclusive?
6. How many times ½ can be taken from 5 so as to leave no remainder?
7. If the 28th January was a Tuesday what would be the date of the following Saturday?
8. How much for a dozen mats at 6¾d. each?
9. What is three times 25?

10. Two taps exactly alike fill a watering-can in two minutes. How long would one tap take?

Exercise 4 (For Children of 11 Years)

1. Write the next highest number of the series ·5, ·75, 1·0.
2. 100 minus $17\frac{3}{4}$?
3. Find the average of ·7, ·3, ·5.
4. How much for 19 tickets at 2s. 6d. each?
5. If each side of a square is doubled how many times will its area be increased?
6. How many times is $3\frac{1}{2}$d. contained in 3s. 6d.?
7. What fraction of the distance round the clock face does the hour hand move from 4 to 7 o'clock?
8. What decimal of £1 is 5s.?
9. 4 yd. of cloth at 1s. $11\frac{3}{4}$d. a yd.?
10. I have three times as much money as my brother, and he has 4d. less than I. How much have I?

SHORT METHODS AND HINTS USEFUL IN THE MENTAL ARITHMETIC LESSON

MULTIPLICATION

To Multiply a Number by

(1) **10, 100, 1,000** etc.: Add as many noughts to the end of the number as there are in the multiplier, e.g. $15 \times 10 = 150$; $15 \times 100 = 1{,}500$.

(2) **5** ($= \frac{10}{2}$): Multiply by 10 and divide by 2, e.g. $17 \times 5 = 170 \div 2 = 85$.

(3) **50** ($= \frac{100}{2}$): Multiply by 100 and divide by 2, e.g. $19 \times 50 = 1{,}900 \div 2 = 950$.

(4) **25** ($= \frac{100}{4}$): Multiply by 100 and divide by 4, e.g. $23 \times 25 = 2{,}300 \div 4 = 575$.

(5) **125** ($= \frac{1000}{8}$): Multiply by 1,000 and divide by 8, e.g. $41 \times 125 = 41{,}000 \div 8 = 5{,}125$.

(6) **9** ($= 10 - 1$): Multiply by 10 and subtract the original number, e.g. $57 \times 9 = 570 - 57 = 513$.

(7) **99** etc. ($= 100 - 1$): Multiply by 100 and subtract the original number, e.g. $35 \times 99 = 3{,}500 - 35 = 3{,}465$. Similarly $999 = (1{,}000 - 1)$, $98 = (100 - 2)$.

(8) **11** etc. ($= 10 + 1$): Multiply by 10 and add the original number, e.g. $82 \times 11 = 820 + 82 = 902$. Similarly $101 = (100 + 1)$; $111 = (100 + 10 + 1)$; $1{,}001 = (1{,}000 + 1)$.

DIVISION

To Divide a Number by

(1) **10, 100, 1,000** etc.: Strike off as many figures from the end of the number as there are noughts in the divisor, e.g. $60 \div 10 = 6$; $250{,}000 \div 100 = 2{,}500$.

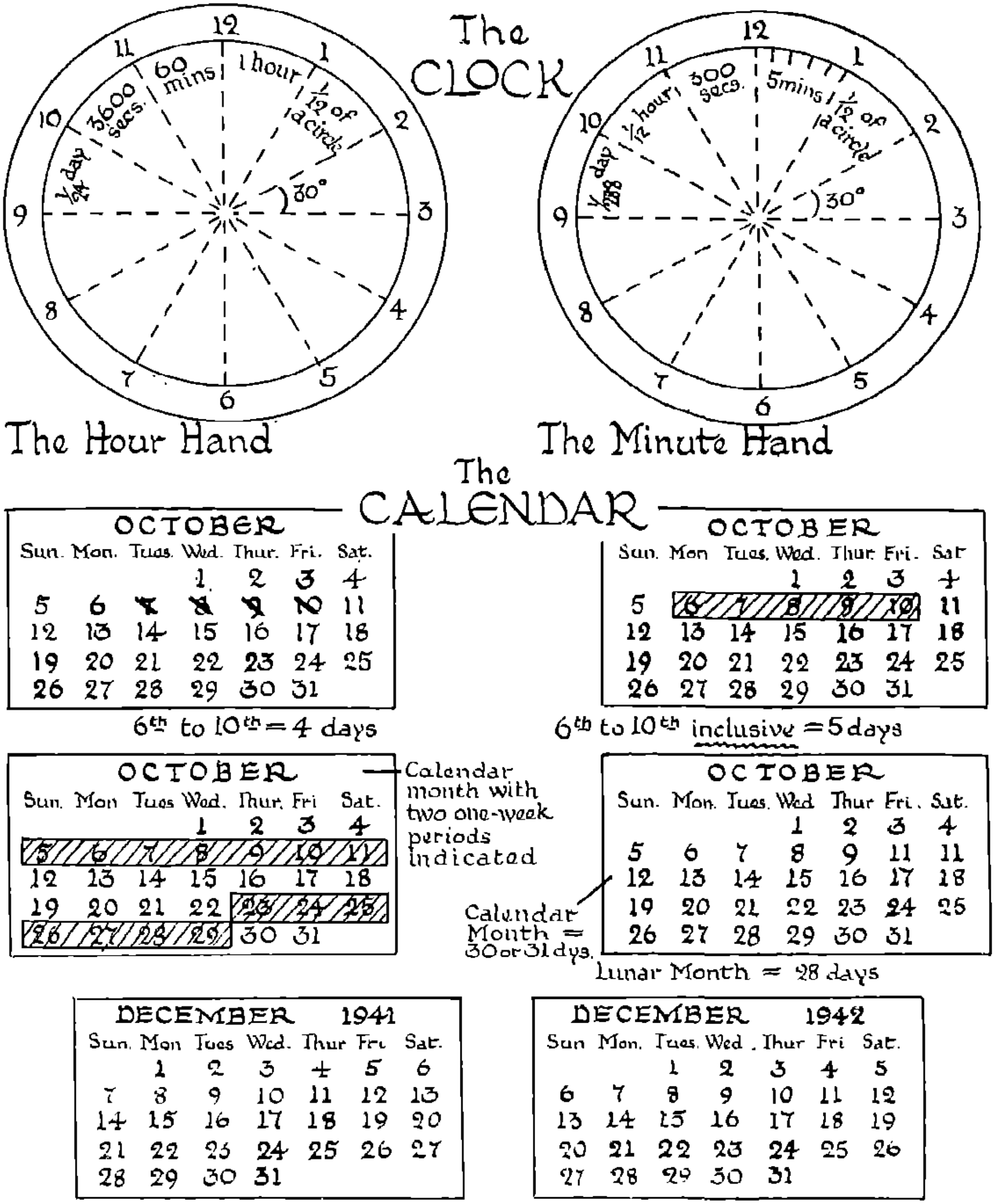
(2) **5** ($\frac{1}{5} = \frac{2}{10}$): Multiply by 2 and divide by 10, e.g. $110 \div 5 = 220 \div 10 = 22$.

(3) **50** ($\frac{1}{50} = \frac{2}{100}$): Multiply by 2 and divide by 100, e.g. $1{,}600 \div 50 = 3{,}200 \div 100 = 32$.

(4) **25** ($\frac{1}{25} = \frac{4}{100}$): Multiply by 4 and divide by 100, e.g. $375 \div 25 = 1{,}500 \div 100 = 15$.

Alternative Method. 25 is contained 4 times in 100, 3 times in 75, 2 times in 50. Then by inspection—

$$125 \div 25 = (1 \times 4) + 1 = 5$$
$$150 \div 25 = (1 \times 4) + 2 = 6$$
$$175 \div 25 = (1 \times 4) + 3 = 7$$
$$200 \div 25 = (2 \times 4) + 0 = 8$$



OCTOBER

Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
			1	2	3	4
5	6	~~7~~	~~8~~	~~9~~	~~10~~	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

6th to 10th = 4 days

OCTOBER

Sun.	Mon	Tues.	Wed.	Thur.	Fri.	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

6th to 10th inclusive = 5 days

OCTOBER

Sun.	Mon	Tues	Wed.	Thur.	Fri	Sat.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Calendar month with two one-week periods indicated

OCTOBER

Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
			1	2	3	4
5	6	7	8	9	11	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Calendar Month = 30 or 31 dys.

Lunar Month = 28 days

DECEMBER 1941

Sun.	Mon	Tues	Wed.	Thur	Fri	Sat.
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

DECEMBER 1942

Sun	Mon.	Tues.	Wed.	Thur	Fri	Sat.
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

(Diagrams to show why a date falls on successive week-days)

FIG. 2

Clock and Calendar Diagrams for the Blackboard

Rule. Multiply the number of hundreds by 4 and add on the number of times 25 is contained in the last 2 figures, e.g. 1,275 ÷ 25 = (12 × 4) + 3 = 51.

(5) **125** ($\frac{1}{125} = \frac{8}{1000}$): Multiply by 8 and divide by 1,000, e.g. 1,375 ÷ 125 = 11,000 ÷ 1,000 = 11.

Alternative Method. 125 is contained 8 times in 1,000, 7 times in 875, 6 times in 750, etc. Then by inspection—

1,125 ÷ 125 = (1 × 8) + 1 = 9
1,250 ÷ 125 = (1 × 8) + 2 = 10
1,375 ÷ 125 = (1 × 8) + 3 = 11
1,500 ÷ 125 = (1 × 8) + 4 = 12
1,625 ÷ 125 = (1 × 8) + 5 = 13
1,750 ÷ 125 = (1 × 8) + 6 = 14
1,875 ÷ 125 = (1 × 8) + 7 = 15
2,000 ÷ 125 = (2 × 8) + 0 = 16

Rule. Multiply the number of thousands by 8 and add on the number of times 125 is contained in the last 3 figures, e.g. 11,750 ÷ 125 = (11 × 8) + 6 = 94.

RULES FOR DIVISIBILITY

A Number is Exactly Divisible by

2 if it is an even number, i.e. if its last figure is 0 or is divisible by 2.

4 if its last two figures are 00 or are divisible by 4.

8 if its last three figures are 000 or are divisible by 8.

5 if the last figure is 0 or 5.

10 if the last figure is 0.

3 if the sum of the figures composing the number is divisible by 3, e.g. 1,110 (sum of figures = 3); 2,375,082 (sum of figures = 27).

9 if the sum of the figures composing the number is divisible by 9, e.g. 82,791 (sum of figures = 27).

6 if the number is even and divisible by 3.

12 if the number is divisible by 4 and by 3.

11 if the difference between the sum of the figures in the odd-numbered places and the even-numbered places is either 0 or is divisible by 11, e.g. 8,370,659—

Sum of figures in odd-numbered places
= 9 + 6 + 7 + 8 = 30
Sum of figures in even-numbered places
= 5 + 0 + 3 = 8
Difference = 22

MONEY, DOZENS, AND SCORES

The short methods of dealing with the price of dozens and scores depend upon these statements—

If one costs *x* pence then a dozen costs *x* shillings.

If a dozen costs *x* shillings then one costs *x* pence.

If one costs *x* shillings then a score costs *x* pounds.

If a score costs *x* pounds then one costs *x* shillings.

These are fully dealt with elsewhere, as are also the simple methods based upon 19s. 11d., 9s. 11d., and 1s. 11d. (See pp. 318–19.)

Pupils should also be taught that since 12 in. = 1 ft.—

1d. an inch = 1s. a foot
2½d. an inch = 2½s. a foot
5s. a foot = 5d. an inch
15s. a foot = 1s. 3d. an inch,
and so on.

Also, since there are 12 calendar months in a year—

1d. a month = 1s. a year
1½d. a month = 1s. 6d. a year
10s. a year = 10d. a month
14s. a year = 1s. 2d. a month,
and so on.

Other Short Methods of Dealing with Money

(1) These are based upon a knowledge of the aliquot parts of a shilling and of £1.

(*a*) To find prices of articles at 1½d., 2d., 3d., 4d., and 6d. each.

At **$1\frac{1}{2}$d.**: Call the number of articles SHILLINGS and divide by **8**.
At **2d.**: Call the number of articles SHILLINGS and divide by **6**.
At **3d.**: Call the number of articles SHILLINGS and divide by **4**.
At **4d.**: Call the number of articles SHILLINGS and divide by **3**.
At **6d.**: Call the number of articles SHILLINGS and divide by **2**.

(*b*) To find prices of articles at 10s., 2s., 4s., 5s., 2s. 6d., 3s. 4d., 6s. 8d., 1s. 8d. each.

At **10s.**: *Call the number of articles* POUNDS and divide by **2**.
At **2s.**: Call the number of articles POUNDS and divide by **10**.
At **4s.**: Call the number of articles POUNDS and divide by **5**.
At **5s.**: Call the number of articles POUNDS and divide by **4**.
At **2s. 6d.**: Call the number of articles POUNDS and divide by **8**.
At **3s. 4d.**: Call the number of articles POUNDS and divide by **6**.
At **6s. 8d.**: Call the number of articles POUNDS and divide by **3**.
At **1s. 8d.**: Call the number of articles POUNDS and divide by **12**.

(2) To find the price of 52 articles; or, given a sum per week, to find the amount per year.

52 = 48 + 4; 48 fs. = 1s., 4 fs. = 1d.
∴ 52 fs. = 1s. 1d.

52 at $\frac{1}{2}$d. = 1s. 1d. × 2 = 2s. 2d.
52 at 5d. each: 5d. = 20 fs. ∴ 52 at 5d. = 20s. + 20d. = £1 1s. 8d.
52 at $7\frac{1}{4}$d. each: $7\frac{1}{4}$d. = 29 fs. ∴ 52 at $7\frac{1}{4}$d. = 29s. + 29d. = £1 11s. 5d

(3) To find the price of 365 articles; or, given a sum per day, to find the amount per year.

365 = 240 + 120 + 5
∴ 365d. = £1 + 10s. + 5d.

365 at 2d. each = £2 + (2 × 10s.) + (2 × 5d.) = £3 0s. 10d.
365 at 3d. each = £3 + (3 × 10s.) + (3 × 5d.) = £4 11s. 3d.

MONEY, WEIGHTS, AND MEASURES

Children should not only be familiar with the *tables*, but they should be given practice in exercises similar to the following, which involve an understanding of these tables—

How many times is 2d. contained in 2s.? (12.)
How many times is $4\frac{1}{2}$d. contained in 4s. 6d.? (12.)
How many times can 3s. be taken from £3? (20.)
How many guineas are worth £21? (20.)
How many times can 9 in. be cut from 9 ft.? (12.)
How many times is 15 min. contained in 15 hours? (60.)
How many 5 cwt. sacks weigh 5 tons? (20.)
How many areas of 12 sq. ft. will make 12 sq. yd.? (9.)
What fraction of £8 is 8s.? ($\frac{1}{20}$.)
What fraction of 1s. 6d. is $1\frac{1}{2}$d.? ($\frac{1}{12}$.)
What fraction of 8 lb. is 8 oz.? ($\frac{1}{16}$.)
What fraction of 2 sq. ft. is 2 sq. in.? ($\frac{1}{144}$.)

ROUGH APPROXIMATION

Rough approximations in multiplication sums can often be easily made if one factor is made a little larger and the other factor a little smaller,

e.g. 97 × 42 = 100 × 40 approx.
1·01 × ·97 = 1 × 1 approx.
$6\frac{7}{8}$ × $3\frac{1}{4}$ = 7 × 3 approx

METHODS FOR OCCASIONAL USE

The more advanced pupils are sometimes interested in these short methods which can be used in special cases—

(*a*) $x^2 = (x + 1)(x - 1) + 1$

$5^2 = (6 \times 4) + 1 = 25$
$19 \times 19 = (20 \times 18) + 1 = 361$
$99 \times 99 = (100 \times 98) + 1 = 9801$

(*b*) $x^2 - y^2 = (x + y)(x - y)$
Difference between 7×7 and $6 \times 6 = (7 + 6)(7 - 6) = 13 \times 1 = 13$.

Difference between 18^2 and $8^2 = (18 + 8)(18 - 8) = 26 \times 10 = 260$.

PUZZLERS

The following are a selection of little things which often cause our most promising Juniors to stumble, and a few minutes of the Mental Arithmetic lesson might well be spent in considering them.

(1) A quantity is *diminished* if *multiplied* by a *fraction*—

$4 \times \frac{1}{2} = 2$; $3 \times \cdot 5 = 1\cdot 5$
$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$; $\cdot 1 \times \cdot 1 = \cdot 01$.

A quantity is *increased* if *divided* by a *fraction*—

$4 \div \frac{1}{2} = 8$; $3 \div \cdot 05 = 60$
$\frac{1}{2} \div \frac{1}{2} = 1$; $\cdot 1 \div \cdot 01 = 10$.

(2) The hour hand of a watch does 2 revolutions per day. (1 *per* 12 *hr.*)

The minute hand of a watch does 24 revolutions per day. (1 *per hr.*)

The second hand of a watch does 1,440 revolutions per day. (1 *per min.*)

(3) How many numbers from 9 to 19? (*Subtract; answer*, 10.)

How many numbers from 9 to 19 inclusive? (*Subtract and add one; answer* 11.)

How many numbers between 9 and 19? (*Subtract one from the difference; answer* 9.)

How many even (or odd) numbers from 9 to 19? (*Subtract and divide by* 2; *answer*, 5.)

(4) Number of days from Monday to Friday. (4.)

Number of days from Monday to Friday inclusive. (5.)

Number of days between Monday and Friday. (3).

(5) Difference between the first and the last of 4 consecutive numbers? (3); of 5 consecutive numbers? (4); of 10 consecutive numbers? (9.) (*Answer one less than the given number.*)

(6) What does 2 become when multiplied by itself twice? (*Answer*, $2 \times 2 \times 2 = 8$.) If multiplied by itself 3 times? (*Answer*, $2 \times 2 \times 2 \times 2 = 16$; *always one more factor than the number of times.*)

(7) How many marks are required to be made to divide a yard measure into feet? (2); a foot-rule into inches? (11); a metre scale into centimetres? (99); a quart pot into pints? (1.)

(8) If 12 posts stand in a row, how many spaces between them? (11.)

If 12 posts stand in a circle, how many spaces between them? (12.)

(9) A man is 40 years old and his son 10 years. What is the difference between their ages? (30 *years.*)

What was the difference five years ago? (30 *years.*)

What will it be in five years hence? (30 *years.*)

(10) If one child eats his breakfast in 10 min., how long should it take 5 children to eat their breakfasts? (10 *min.*)

ARITHMETICAL TREATMENT OF ENGLISH MONEY

MONEY sums must inevitably loom large in the Arithmetic syllabus in all English schools, especially during the four Junior years, since it is necessary in later life that all pupils should be familiar with our money system, the units and their relationships. On the other hand, there has been a distinct tendency in recent years for teachers to avoid the more laborious and lengthy calculations in money, and to confine the pupil's attention to such simple calculations and transactions as are likely to be met with in ordinary life.

Roman Denarius
(*about* 260 *B.C.*)

Persian Gold Daric
(521–485 *B.C.*)

Milled Sixpence of Elizabeth
(*Milled edge introduced to prevent filing of coins*)

Sovereign of Henry VII
(*During this reign sovereigns and shillings first appeared*)

FIG. 3
Some Interesting Coins

Unfortunately, the nature of our coinage, so complex compared with the simplicities of a decimal coinage, causes weary months and years to be occupied in mastering money sums, which time, according to all "reformers," could be much more profitably spent on other subjects more important than arithmetic. Many teachers, labouring daily with dull and obtuse pupils, must inevitably sigh for that Utopia where ten pennies make one shilling, and ten shillings make one pound, but, *unfortunately*, desirable revolutions of this kind never come rapidly, and so, for the present, the English teacher of Juniors must continue to teach Money Rules with all their vexatious complexities.

The Beginnings

At the outset, the Junior teacher has very little to work upon except the fact that most children are familiar with small coins and small sums of money from a very early age. This familiarity, strangely enough, is frequently more common among the children of the poorer parents than among others, for much of the day-to-day shopping of the very poor is done by small children of Junior and even Infants' School age. This familiarity is a very useful starting point, and may be utilized and extended through the handling, in shopping "activities," of imitation coins made of cardboard or other material.

In addition to this knowledge, acquired in and out of school, pupils from good Infants' Schools will have performed orally many simple calculations in money, especially in finding simple costs and in giving change. Again, in dealing with the analysis of the numbers 12 and 20, shillings and pounds are such obvious illustrations that they are now used by every teacher at a very early stage. Lastly, in dealing with halves and quarters, halfpennies and farthings, and the method of writing them are common introductions to ordinary fractional notation.

The average child, then, entering the Junior School with the above knowledge, even if totally ignorant of money "rules," has a sufficient background or basis upon which these rules can readily be taught.

Money Rules—Addition of Money

This process is fundamental, and is required in every walk of life. While "comptometers" and adding machines continue to invade our modern banks and commercial offices, where a multiplicity of additions must daily be accurately performed, it is still necessary for the average Englishman and Englishwoman to be able to add rapidly and accurately simple sums of money, even if the more fortunate are able to entrust their pass books and bank balances to the capable hands of clerks and cashiers.

So far as the actual *addition* is concerned, this does not differ from *simple* addition save in the change from one unit to another, i.e. from pence to shillings, and shillings to pounds (for it should be noted that in most transactions, and in all banks, no sum is admitted which involves halfpennies or farthings). In this addition and change of units many different methods are adopted, and each adult person is prone to use the particular method which he or she learned in childhood. It follows, too, from this same conservatism, that teachers would be less than human if they did not have, most of them, a very distinct preference in teaching for those methods which they themselves were taught as children. It is, therefore, all the more necessary that teachers should carefully consider the methods to be taught in these simple calculations, and should not of necessity feel bound to teach what *they* were taught, if later reflection convinces them that better methods exist.

In the actual process of addition of money, two common methods are in vogue, and between these two methods there is little to choose. We may illustrate by a simple example in the addition of pence—

EXAMPLE.

s.	d.
	6
	7
	9
	5
	8
2	11

Method 1. The numbers will be added *as* numbers, i.e. 8, 13, 22, 29, 35. These 35 pence are then "reduced" to shillings and pence, i.e. 2*s.* 11*d.*

Method 2. The addition is actually performed in shillings and pence, the shillings being "made up" as the addition proceeds. The steps accordingly are 8d., 1s. 1d., 1s. 10d., 2s. 5d., 2s. 11d.

Method 1 requires only the ability to add *numbers* and a ready knowledge of the pence "table."

Method 2 appears to be more rational and direct, but actually in practice is no quicker than Method 1.

Similar alternative methods are used in dealing with halfpennies and farthings, and with shillings. In the addition of shillings the fact that it is necessary to add numbers up to 19 has caused many minor variations of procedure to be introduced. We may illustrate by an example—

EXAMPLE.

	s.
	13
	17
	9
	14
	12
£3	5

This is commonly performed by the addition first of the units and then of the "tens." The steps would then be (beginning from the bottom) 2, 6, 15, 22, 25, 35, 45, 55, 65. *Answer* £3 5*s.*

Some teachers, however, would "convert" as soon as the *units* had been added, i.e. at 25, giving this as £1 5s., and proceeding with the "tens" (two at a time) as £2 5s., £3 5s.

The methods indicated above illustrate the main divergences in details of method, though other methods exist among teachers of experience, many of whom have evolved interesting methods of their own for overcoming difficulties commonly met with by the pupils.

In dealing with addition generally, it may again be emphasized that *horizontal* as well as *vertical* addition should be practised, and that the old device of adding "rows and columns," and so finding and checking a "grand total" should regularly be used.

In all addition of money the aim should never vary, viz. accuracy and rapidity. In this connection "tots" and other "mechanical" sums, in the reaction against drudgery of every kind, tended to be rejected in our schools. Further experience has, however, convinced all teachers that "mechanical" practice is still necessary, if the habit of speedy accuracy is to be formed. The *Handbook of Suggestions* has endorsed this opinion, for it is definitely stated as follows—

> Children should frequently be set to work quickly sums which present no difficulty as to method; in this way they may be led to combine speed with accuracy, and a valuable opportunity is afforded for revision. The amount of time spent in this practice will vary from school to school, but it should seldom amount to less than one lesson per week.

Subtraction of Money

The teaching of formal subtraction of money presents exactly the same difficulties as the teaching of simple subtraction. Various methods are in favour with different teachers, though on the whole, to-day, it is possible that the method formerly known as "borrowing and paying back," and now usually termed the method of equal additions, is the one most in vogue in Junior Schools. Actually, however, teachers to-day seldom begin to teach subtraction through the medium of the formal sum. Rather, they give the class plenty of mental practice in subtraction regarded as complementary addition, and require the pupils to "make up" odd sums of money to "round" sums (usually sums represented by well-known coins). This "making-up" method of performing subtraction is commonly in use in the ordinary shop. Thus in "subtracting" 7s. 4½d. from 10s. most shopkeepers would say, mentally or actually, "And a *halfpenny* makes 5d., and *sevenpence* makes 8s., and *two shillings* makes 10s.," and the change appears on the counter as 2s. 7½d. This simple process gives the key to teachers for the earlier exercises in the subtraction of money. These will take the form of graded exercises of the following kind—

(*a*) What will make the following sums up to 1s.: 9d., 7d., 5d., 10½d., 8½d., 4½d., etc., etc.?

(*b*) What will make the following sums up to 2s. 6d.?: 1s. 10d., 1s. 7d., 1s. 3d., 11d., 7d., etc., etc

(*c*) What will make the following sums up to £1? 15s., 13s., 11s., 9s., 17s. 6d., 13s. 6d., 7s. 6d., etc., etc.

Formal Methods in Subtraction

These can best be illustrated by a simple example—

	£	*s.*	*d.*
From	2	3	4
Take	1	11	9

(*a*) METHOD OF DECOMPOSITION

The above example would actually be worked on this method as follows—

£	*s.*	*d.*
1	22	16
1	11	9
	11	7

The magic words which the pupil mutters to himself in performing this calculation may differ slightly from school to school, but, in the end, the sum is actually worked as set out in (*a*) above.

(*b*) METHOD OF EQUAL ADDITIONS

On this method the sum is actually worked as follows—

£	*s.*	*d*
2	23	16
2	12	9
	11	7

Here again it is really of small importance whether the pupil mutters "borrow a shilling" and "pay back a shilling," or "add twelve pence" and "add a shilling."

The method by which the ordinary adult works the above example should now be carefully noted.

EXAMPLE.

£	*s.*	*d*
2	3	4
1	11	9

Most adults would probably work this as follows—

(*a*) 9 *and* 3 make 12 (1s.); 3 and 4 make 7. Put down 7. (*b*) 12 *and* 8 make 20; 8 and 3 make 11. Put down 11. (*c*) 2 from 2 leaves 0. *Answer* 11s. 7*d*.

The above working, which develops quite naturally out of the method of equal additions, is practically indistinguishable from the method of complementary addition or "making up," discussed above.

Whatever method is finally adopted, it is most desirable that, by co-operation with the teachers in Secondary Schools, the pupils should not be thrown into that utter confusion which comes from an entire change of method half way through their school career.

Addition and Subtraction in One Operation

The "making up" method is particularly useful in examples where "balances" have to be found. We may illustrate this by the following example—

What is left out of £1 after the following sums have been spent: 2s. 6d., 3s. 11d., 4s. 5d., and 6s. 6d.?

Now most pupils (and most adults) would make *two* sums of this example, first adding the sums spent, and then subtracting this total from £1. Actually, however, the answer can be found in one operation as follows—

Pence, 6d., 11d., 1s. 10d., 2s. 4d., *and 8d.* makes 3*s*. Put down 8*d*. and carry 3*s*.
Shillings, 3*s*., 9s., 13*s*., 16*s*., 18*s*., *and* 2*s*. makes £1. Put down 2s.
Answer 2s. 8*d*.

£	*s.*	*d.*
1	–	–
	2	6
	3	11
	4	5
	6	6
	2	8

It will be noted that by this method the balance (2s. 8d.) is found directly; that the sum of the amounts expended is *not* found and not required; and that further addition forms a ready check on the answer obtained. The method can be readily applied to the finding of "bank" balances where a series of sums have been spent out of a given sum, and the "balance" left is required.

Multiplication of Money

Multiplication of money does not to-day occupy such a prominent place in school arithmetic as it did a generation ago. Various reasons may be adduced for this change of attitude on the part of teachers. It is recognized that long and complex multiplications such as £237 17s. 9½d. × 3456 do not occur in the majority of ordinary lives, and that, in the simpler cases which now occupy our pupils, simple methods of "practice" are usually much more suitable for the purpose.

(*a*) TRADITIONAL METHOD

The traditional method of working an example such as the above was on the basis of the "10—10—10" method. The pupil first calculated the multiples of 10 as follows—

£	*s.*	*d.*	
237	17	9½	(cost of 1)
2378	17	11	(cost of 10)
23788	19	2	(cost of 100)
237889	11	8	(cost of 1,000)

The second part may conveniently be set down as follows—

£	*s.*	*d.*			£	*s.*	*d.*
237	17	9½	× 6	=	1427	6	9
2378	17	11	× 5	=	11894	9	7
23788	19	2	× 4	=	95155	16	8
237889	11	8	× 3	=	713668	15	–
					£822146	8	–

The method of setting out the traditional working just given is strongly recommended to all teachers as it is much neater in appearance than that usually employed.

(*b*) ALTERNATIVE METHOD

This may be illustrated by another example: 5s. 6½d. × 267.

The working is usually set out as on the right, and will be seen to consist of alternate steps of multiplication and reduction.

This method is of universal application, and it is claimed that, when the pupils are thoroughly familiar with its use, it is more rapid and reliable than any other.

		s.	*d.*
		5	6½
		267	
½d. × 267		133—	½d.
6d. × 267		1602	
	12	1735	
		144—	7d.
		1335	
	20	1479	
		£73 19	7½

(*c*) The "Practice" Method

It has not been customary to introduce Junior pupils to the convenient method of multiplication known as "Practice," but for purposes of comparison we work the above example by this Practice method.

		£	s.	d.		
		267	–	–	=	cost at £1.
5s. =	¼	66	15	–	=	" " 5s.
6d. =	$\frac{1}{10}$	6	13	6	=	" " 6d.
½d. =	$\frac{1}{12}$		11	1½	=	" " ½d.
		73	19	7½	=	" " 5s. 6½d.

(*d*) The Method of Denominational Units

This method of multiplication of money has an increasing number of adherents among *teachers of Junior pupils.* It is best illustrated by an example—

£2 7s. 8½d. × 39

The first step consists of the evaluation of units, i.e. 39 at 1s., 39 at 1d., and 39 at ½d. These are as follows—

	£	s.	d.
39 at 1s. =	1	19	–
39 at 1d. =		3	3
39 at ¼d. =			9¾

These *units* are *then* used as follows in the complete calculation—

	£	s.	d.	
	2			
	39			
	78			
£1 19s. × 7 =	13	13	–	(39 at 7s.).
3s. 3d. × 8 =	1	6	–	(39 at 8d.).
9¾d. × 2 =		1	7½	(39 at ½d.).
	£93	0	7½	

The method will be seen to be a combination of practice and simple multiplication. For *simple sums of money and multipliers which* are not too large, it has many advantages, and *is capable of general application.*

It will be clear to teachers that the above general methods *for multiplying* sums of money cannot all be taught in full from the earliest Junior years. Rather, it will be necessary to approach, whatever method is finally chosen, by carefully graded steps. Thus at the earliest stages we shall begin with simple sums of money and multipliers consisting of a single digit. The following will illustrate this stage—

(*a*) 1s. 4d. × 4. (*b*) 2s. 9d. × 6. (*c*) 3s. 9d. × 7.

At the next stage it is customary to proceed to the simplest cases of multiplication by factors. Thus the example 3s. 7d. × 16 will be worked in two stages as 3s. 7d. × 4 × 4—and will be set out in the usual *form as shown on the right.*

This method is usually extended to all *multipliers within* the compass of the products in the ordinary multiplication table. It may further be applied to multipliers which are near to ordinary factorizable multipliers, e.g. 29 may be used as a multiplier in the form (7 × 4) + 1. The traditional method is based primarily upon multiplying first by 10, 10, 10, etc., the factor method as applied to multiples of ten.

	s.	d.
	3	7
		4
	14	4
		4
£2	17	4

Much useful work may be accomplished in multiplication of money by the various methods outlined above, but, as we have already stated, less importance is now attached to the teaching of this type of example, especially when it involves the use of large multipliers. In any particular walk of life where these long calculations are required a ready reckoner or calculating machine would inevitably be used to-day. Hence, *teachers of Juniors will continue to teach* multiplication of money, but if they are wise *they will restrict the work to the multiplication* of *small* sums of money by multipliers of reasonable size.

Division of Money

The division of money, in its two aspects of Partition and Quotition, or "sharing" and "measuring" as they are popularly termed, gives rise to two different processes which may be illustrated by the following examples—

(*a*) Divide £3 7s. 6d. among 27 people.
(*b*) How many people can have 2s. 6d. each out of *£3 7s. 6d.?*

The first type of division is known as simple division, i.e.

£3 7s. 6d. ÷ 27 (Partition).

The second type of division is usually termed *concrete* division, i.e.

£3 7s. 6d. ÷ 2s. 6d. (Quotition).

At this stage we shall discuss only the simple division of money, and shall reserve the more difficult matter of concrete division until we discuss the subject of reduction of money.

We shall discuss simple division of money in the stages by which it is usually developed in our Junior Schools, i.e.—

(*a*) Division by numbers up to 12:
(usually termed *short* division).
(*b*) Division by numbers above 12:
(usually termed *long* division, although occasionally possible by factors).

(*a*) SHORT DIVISION OF MONEY

This usually presents few difficulties. All that is necessary is ordinary ability to divide, and ability to change the units which are "over" at each step into units of a lower denomination.

	£	s.	d.
5	13	7	6
	£2	13	6

Thus in the example as here set out, at the first step, the £3 "over" is converted to 60s. At the second step, the 2s. "over" is converted to 24 pence, and the correctness of the final answer may be readily checked by re-multiplication. At the earliest stages examples *without remainder* will be given, but as soon as possible remainders should be introduced, and it is most important that the correct method of writing this remainder should be taught. This may be illustrated by a slight variation of the above example, e.g.—

£13 7s. 9d. ÷ 5.

	£	s.	d
5	13	7	9
	£2	13	6½ rem. ½d.

This may be set out as here shown. Here the quotient at the "pence" stage is 6d., with 3d. "over." This 3d. is converted to farthings and the final quotient is ½d., with 2 farthings "over." This remainder should always be given in its actual value, and no answer should ever be accepted in the meaningless form so often seen, i.e. £2 13s. 6½d. + 2.

It should further be noted that any division such as that just discussed may be performed *theoretically without any remainder*, i.e. £13 7s. 9d. ÷ 5 is actually £2 13s. 6·6d., which is mathematically the exact fifth part of the dividend. This mathematical conception is beyond the capacity of the Junior pupils, who will accordingly perform the division correct to the nearest penny or nearest farthing, and give the remainder, if any, in correct form in each case as indicated above.

(*b*) DIVISION OF MONEY BY FACTORS

This process, though easy of application in special cases, has never been very popular in schools, the chief reason being the difficulty of calculating the remainder. Where *no* remainder occurs, all that is necessary is the application of successive steps of short division. Thus the example: £37 10s. ÷ 24 may be worked either as (*a*) or (*b*) or (*c*).

(*a*)

	£	s.	
4	37	10s.	
6	9	7	6
	£1	11	3

(*b*)

	£	s.	
3	37	10s.	
8	12	10	
	£1	11	3

(*c*)

	£	s.	
2	37	10s.	
12	18	15	
	£1	11	3

Where remainders occur the examples at once become very difficult for children under the age of 11.

Consider the following example—

£47 12s. 6d. ÷ 24

Using the factors 4, 6, and working to the nearest penny this example may be set out as follows—

	£	s.	d.		
4	47	12	6		
6	11	18	1,	remainder 2d.	total remainder 6d.
	£1	19	8,	remainder 1d.	

The calculation of the remainder in division by factors may be taught as a trick, but is seldom understood by children. The present tendency is accordingly to resort in all cases to the general method of *long* division, where the difficulty of the value of the remainder at any stage of the division is much less formidable.

(*c*) LONG DIVISION OF MONEY

This process is perhaps the most difficult, and certainly the most cumbersome, of all the processes of calculation which an English child is called upon to perform. The ordinary difficulties of long division of number are here complicated still further by the necessity of changing pounds to shillings, shillings to pence, and pence to farthings during the calculation, and the result as usually set out is seen as a long straggling piece of calculation, with infinite possibilities of mistakes at every stage. From its very nature this clumsy process is avoided in adult life wherever possible, but tradition and expediency demand that long division shall be taught and practised at some time during the child's school life if and when he is able to manage it.

The straggling arrangement of the formal process may be avoided if the working is set out on the following plan—

EXAMPLE. £239 14 1 ÷ 87

Working—

```
          2          15          1        ¼
   87|£239           14          10   │→124
       174     │→1300      │→108      │   87
        65←────┘  1314     │  118     │   37
                    87     │   87     │
                   444     │   31←────┘
                   435     │
                     9←────┘
```

Answer £2 15s. 1¼d., rem. 37 f.

If the so-called "Italian" method is adopted, the example, worked on this plan, presents an exceptionally neat appearance.

Reduction of Money

The relations existing between the values of the various money units and the ability to pass rapidly from one kind of unit to another form an essential part of English arithmetic, and as such must receive regular attention at the Junior stage. All children must receive regular practice, oral and written, in the transactions from farthings to pence, pence to shillings, shillings to pounds, and *vice versa*. This process of multiplying and dividing by any or all of the basic factors, 4, 12, and 20, has traditionally been known as the Reduction of Money, which is part of the whole subject of reduction as applied to money systems, weights or measures of any kind.

In the past it has been customary to teach the process in its complete form, and to require the pupils almost from the outset to go through all the steps in changing pounds to farthings or farthings to pounds. It is now agreed that these sums are largely meaningless to young pupils, and that what is required in the early stages is constant oral practice in the *simple* steps, preferably one at a time. The following examples will indicate what we mean—

1. *How many halfpenny* stamps can be bought for 7½d.?
2. What will be the cost of 21 halfpenny stamps?
3. How many boys can have a penny each out of 1s. 9d.?
4. What will be the cost of 32 cakes at 1d. each?
5. How many girls can have 1s. each out of £1 15s.?
6. What will a boy save in a year of 52 weeks at 1s. per week?

Examples of this kind illustrate all the usual steps one at a time.

They may be extended to include the common English coins and units other than pence and shillings. Thus—

1. How many sixpences are there in 7s. 6d.?
2. Change 17 sixpences to shillings and sixpences.
3. What is the cost of 20 books at 3d. each?
4. How many threepences are there in 4s. 9d.?
5. Change 27 florins to £ s.
6. How many boys can have 2s. out of £1 10s.?
7. A sum of £1 7s. 6d. was paid in half-crowns. How many were there?
8. What is the value in £ s. d. of 18 half-crowns?

These may be repeated and extended indefinitely, and afford the best practice not only in reduction but also in "aliquot parts" of £1, which will be of very great assistance later in teaching the useful method of calculation.

By practice such as is outlined above the pupils will gradually become familiar not only with the change or "reduction" from one unit to another, but also with such useful correspondences as—

£1 = 240 pence = 480 halfpence = 960 farthings.
£1 = 20 shillings = 40 sixpences = 80 threepences.
£1 = 10 florins = 8 half-crowns.

These useful relations may further be explored and emphasized by "counting" exercises such as counting by half-crowns from 2s. 6d. to £1 or counting by threepences from 3d. to 5s.

The General Method of Reduction

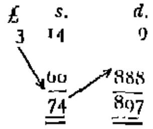
EXAMPLES—

(*a*) Change £3 14s. 9d. to pence.
(*b*) Change 2345 halfpence to £ s. d.

These are traditionally worked as follows—

```
(a)   £   s.  d.        (b)
      3   14   9              2 │2345│ 1 halfpenny.
     20                      12 │1172│ 8 pence.
     ──                     2'0 │9'7 │ 17 shillings
     74                           ───
     12                            4
    897                      £4  17s.  8½d.
    ───
```

As in the case of long division, the former working (*a*) may be alternatively arranged as follows—



"Downward" reduction, illustrated in (*a*) above may also be neatly performed in many cases by the following method—

EXAMPLE: change £9 8s. 7d. to farthings.

$$\begin{array}{rcr} 960 \times 9 & = & 8640 \\ 48 \times 8 & = & 384 \\ 4 \times 7 & = & \underline{28} \\ & & \underline{\underline{9052}} \end{array}$$

The method clearly depends upon a knowledge of £1 = 960 f., 1s. = 48 f., 1d. = 4 f.

Lower units may be changed to units of higher denomination by means of the relationships mentioned above. Thus, in the example "Change 400 pence to £ s. d." we may proceed as follows—

$$\begin{array}{lrcl} & 400 & & \\ & \underline{240} & = & £1 \\ & 160 & & \\ & \underline{120} & = & 10s. \\ & 40 & = & 3s.\ 4d. \\ \text{Total} & & & £1\ 13s.\ 4d. \end{array}$$

This method of large multipliers is frequently a means of saving much time and trouble. The wise teacher will accordingly not insist that all sums in reduction shall be forced into one rigid framework.

Finally it should be remembered that reduction of money as a separate type of example rarely occurs in ordinary life, and that "reduction" is accordingly to be regarded as a process useful in the solution of other arithmetical problems rather than as an end in itself. For this purpose it is fair to our pupils that all examples requiring "reduction" in any form for their solution should be cast in as concrete and attractive form as possible. Numerous examples of this kind will be found in any modern class-book of exercises. We give a few to illustrate what we mean—

1. What will be the cost of a penny newspaper for a year of 313 weekdays?
2. Find the total cost of 9½ dozen penny stamps, 15½ dozen halfpenny stamps, and 12½ dozen three-halfpenny stamps.
3. What will be the total postage on 10,000 circulars at a penny each?
4. A church collection consisted of 17 half-crowns, 29 florins, 76 shillings, 149 sixpences, and 19s. 9d. in copper. What was the total?
5. A bus conductor took £1 in fares at twopence or a penny each. If 98 people paid a penny each, how many paid twopence each?
6. Find the cost of 1 ton (2,240 lb.) at ¼d. per lb.

Concrete Division

This is the usual name applied to that kind of division which is required in the following example—

How many yards at 3s. 7d. per yard can be purchased for £5 3s. 11d.?

At the Junior stage every example of this kind depends upon reduction, and the so-called "division of money by money" is performed as ordinary simple division, after the sums of money have been reduced to the same units. Thus the example given: £5 3s. 11d. ÷ 3s. 7d. appears, after reduction of both sums to pence, as—

$$1247 \div 43$$

whence, by simple division, the quotient is 29. While it is clear that reduction is essentially the first step in examples of this kind, much labour is saved if this reduction is carried out intelligently. Thus an example such as

$$£11\ 9s.\ 6d. \div 8s.\ 6d.$$

may be worked, mechanically and unintelligently by reduction to *pence*, as 2754 ÷ 102, whereas if the reduction is carried to *sixpences* only the example appears in much simpler form as 459 ÷ 17. It is in this judicious selection of units that intelligent, as opposed to merely mechanical, work is to be detected.

The unit chosen becomes of very great importance in determining the value of the remainder. This will be seen from the following example—

How many books at 6s. 6d. each can be bought with £10, and what is left?

Reduced to pence, this gives 2400 ÷ 78, which gives as a quotient 30, with remainder 60 pence or 5s. Reduced to sixpences, the example becomes 400 ÷ 13, which gives as a quotient 30, with the remainder 10 sixpences, or 5s. as before.

Concrete division of this kind is a popular and useful feature if sums are adapted to the ability of the particular group. Numerous examples in various attractive forms will be found in all modern class-books of arithmetic, but teachers who are desirous of constructing their own examples will find it useful to remember that every ordinary multiplication of money provides also an example of "concrete division," which invariably "comes out" without any remainder. Thus, if the answer to 8s. 9d. × 43 is £18 16s. 3d., a concrete division is at once ready in the following—

£18 16s. 3d. ÷ 8s. 9d., to which the answer is 43.

Ordinary division of money (if there is no remainder) in a similar manner provides a "concrete division" example ready to hand. Thus, if the answer to £46 2s. 3d. ÷ 93 is 9s. 11d., then the answer to the concrete example—

£46 2s. 3d. ÷ 9s. 11d. is 93.

If this is remembered, any page of examples in multiplication or division of money may readily be converted to examples in "concrete division," if the teacher has the answers available, as is usually the case.

Finally, it should be remembered that many of the ordinary examples in "concrete division" will, later, be worked very easily as examples in *Fractional* Division. We may illustrate this by the example—

How many books at 5s. 6d. each can be bought for £7 19s. 6d.?

At the Junior stage this would usually be worked by first reducing each sum of money to sixpences, but at the Secondary stage, when fractions are better understood, it would be preferable to work this example as—

159½ ÷ 5½
or 319 ÷ 11 (which gives 29)

This method, though resulting in the same actual division as the more Junior method, is more mathematical and reaches the result with fewer figures.

Shopping and Shopping Sums

Shopping calculations and problems inevitably figure largely in every Junior syllabus, whether for boys or girls. In this connection the latest *Handbook of Suggestions* may be quoted—

> Familiar and interesting "make-believe" and "real life" situations provide the best introduction both to pure arithmetic and to problems. When John, for example, buys at the classroom shop, the class may be led to see that the problem is "What change should he get?" They may go on to describe in their own words concisely and accurately the transaction that takes place, and to say what particular arithmetical operations the transaction has called for. The skilful teacher, by varying the shopping situation, may lead up to a varied series of problems, graded in difficulty.

This extract gives the clue to the main lines which our work in "shopping" must follow. It will give copious practice in simple *costs* and in simple *change*. This practice will, of course, be largely oral or "mental," involving little or no written work, and will be mainly preliminary to more comprehensive shopping "bills" and money accounts generally.

At the earliest stage the examples will mainly involve integral values, i.e. "Find the cost of 2 — at 5d. each." The articles purchased may be of any common variety, e.g. objects such as books, bags, loaves, etc., etc., or yards of material, oz., lb., or any common unit in our weights and measures.

These may be extended indefinitely, and room will be found for the introduction of "short methods" whenever possible. Thus the child will learn that such a calculation as 1s. 11d. × 2 is most easily worked as (2s. × 2) − (1d. × 2) or (4s.) − (2d.). This useful method should be applied in every possible instance. At the next stage, simple multiples will be introduced, such as finding the cost of 12 buttons at 3 for 2d. Examples of this type are most important. We give a number of these in their various aspects—

1. 6 eggs at 4s. 3d. per dozen.
2. 56 lb. at 7 lb. for 6d.
3. 30 eggs at 3s. 6d. per dozen.
4. 45 screws at 10 for 1s.
5. 24 buns at 4 for 3½d.
6. 5 doz. envelopes at 5 for 6d.
7. 350 pins at 25 for 3d.
8. 1,250 envelopes at 4s. per 100
9. 1½ gross pencils at 1s. 6d. per dozen
10. 3,600 cub. ft. of gas at 2s. 6d. per 1,000 cub. ft.

At the next stage, submultiples and fractional parts will be introduced. To illustrate we give a few simple examples—

1. 2⅓ lb. at 9d. per lb.
2. 3¼ yd. at 5s. per yard.
3. 4½ doz. at 3s. 6d. per dozen.
4. 1¾ lb. at 2s. 4d. per lb.
5. 4 doz. and 7 articles at 2s. 6d. per dozen.
6. 4½ gross at 1s. 6d. per dozen.

In all these, short methods should be used where applicable. These can seldom be taught as "rules," but should be treated incidentally as they arise. Thus—

1½ yd. at 10d.

may be worked either as

(*a*) 10 yd. at 1½d. per yard.
or (*b*) 3 yd. at 5d.

Both of these indicate useful algebraical methods applied in very simple form.

Calculations of the above kind are the common calculations in ordinary retail shopping, but for arithmetical purposes they may, of course, all be reversed to give new types of examples. Thus the simple example of finding the cost of 3 at 10d. may be reversed to give the following: "How many at 10d. each can be bought for 2s. 6d." Again, we may introduce (without naming or defining the process) the "method of unity," or the subject of proportionality, by examples such as the following—

(*a*) If 3 cost 2s. 6d. what will 6 cost?
(*b*) If 3 cost 2s. 6d. what will 2 cost?

In all the work, especially at the earlier stages, it is desirable to confine the examples to small numbers and simple commodities at prices common to the shops in the locality.

The School Shop

Shopping, as we have already indicated, is not merely a matter of buying, but also requires a close familiarity with the common coins of the realm, and with the correct "change" to be received after purchasing.

In order to give this required familiarity to their pupils, many teachers use with success the school shop in some form or other. Sympathetically and carefully guided, the child, with its love of pretending, will "play" with evident enjoyment at "shopping," even when shopping at an imitation shop, and purchasing imitation commodities with imitation coins. From the point of view of a small group of pupils the method is natural, interesting, and useful. For a large class many difficulties are obvious, the chief being the preparation required for setting up two or three shops for these "activities," but it is time well spent.

The great advantage of shopping is that the simple exercises in shopping will involve not only calculations and "change," but will also give some acquaintance with the simpler weights and measures as used in retail shops. In this way the young pupil will become acquainted with such things as yards, feet, and inches, pounds and ounces, gallons, quarts, and pints, and other measures, in the most simple and natural way possible. Wise teachers will accordingly maintain some simple shops as a more or less permanent adjunct of Junior School arithmetic, and will arrange for the regular practice of shopping and shopping calculations by small groups of children wherever possible or desirable.

Bills and Accounts

"Bills of Parcels" were formerly a standard feature of every arithmetical syllabus, and still appear prominently in every course of arithmetic of everyday life. In retaining these time-honoured features of English arithmetic, the modern teacher is fortified by the references to the subject in the *Handbook of Suggestions*, from which we quote the following—

> (i) Bills such as the parents may be expected to make out or receive will be useful, and great importance should be attached to teaching the children how to keep simple accounts.
>
> (ii) While all children should be taught to keep simple accounts, girls ought to pay special attention to the detailed accounts accompanying shopping and housekeeping.

At the outset much practice will be given in the calculation of bills such as commonly pass between an ordinary householder and a retail shopkeeper. Other bills of a more "wholesale" nature are sometimes introduced, but care should be taken that these do not deal with numbers, quantities, and commodities which are outside the range of the average pupil. Shopping bills do not, however, represent the only bills received by a householder in the course of a year. In addition to these there are bills from tradesmen of another kind, such as the painter and decorator, the plumber, the gas fitter, the joiner, and all the army of technical "helps" called in by the householder in times of emergency. Most of these will involve "costs" of an entirely different kind from those of the baker, butcher, or greengrocer, and on them the items of "material" and "time" will figure largely. Indeed, it is important to note that simple multiplication of money should frequently be set in concrete form in the shape of labour calculations, e.g. "48 hours at 2s. 3d. per hour," etc. These in simpler form will appear on most bills of the kind we are discussing. To these we may add those important bills for fuel and light, such as bills for coal, coke, or wood, and for gas and electricity. All these in some simple form may be introduced at the Junior stage, and be developed further in the Secondary School.

In their anxiety for "real" examples teachers frequently require these bills to be set out in the form as usually received, and further, teachers frequently require that such bills when "set out" shall be duly receipted even to a facsimile of a stamp. All this work at times may be useful, but it is important that the construction of elaborate bill-heads and receipted statements should not obscure the real object of the exercise, which is that of obtaining a correct answer to a series of calculations. Possibly more reality and more interest would be aroused by the occasional importation into the classroom of a number of actual tradesman's bill-heads, obtained from a friendly neighbouring shopkeeper.

But the mere calculation and setting out of bills does not exhaust their arithmetical possibilities. Occasionally the pupil may be set the task, which falls (or ought to fall) to every householder, of checking bills as received. For this purpose, the teacher should from time to time set bills which are completely but incorrectly worked. The object of the exercise is to detect the mistake or mistakes and to supply the correct statement. It will at once be seen that the work involved is not less than the ordinary type provides, since each item must be carefully reworked in turn. The value of the exercise, and of the habit inculcated, is obvious, for few householders exist who have not at some time or other received bills incorrectly rendered.

Finally, the old device of the game of "missing figures" may be used in connection with bills, as in the following example.

Find the missing figures in the following—

	£	*s.*	*d.*
2 lb. cheese at 1s. 3½d. per lb. =		?	?
3 lb. coffee at ? ? „ „ =		8	3
? lb. tea at 3s. 6d. „ „ =		5	3
60 lb. potatoes at ? lb. for 6d. =		6	–
		?	?

Discounts for Cash

The interesting topic of discounts for cash is usually deferred until the Secondary stage, but some, if not all, Juniors will readily learn to apply simple discounts, such as "1s. in the £" or "1d. in the shilling," to bill totals. The process may be approached orally or mentally through one or two simple steps, e.g.—

1. What is the discount on £5 10s. at 1s. in the £?
2. What shall I pay on a bill of 12s. discounted at 1d. in the shilling?

Other Money Accounts

In addition to bills, many other types of money accounts are available. The most common kind in ordinary life is that of the "Income and Expenditure" type, or of the "Balance Sheet" type, where the usual anxious question in later life is to find out whether the balance is actually "in hand" or adverse. The ordinary commercial and technical terms used in connection with such accounts are not, of course, to be used with Juniors, but the work of discovering such balances must always find a place in arithmetical syllabuses. The "sums" set in this connection will consist usually of expenditure out of a fixed amount, or of the "balance" of *a series of receipts and expenditure.* Of the first kind, the simplest example is illustrated by the following—

What is left out of £1 after spending 2s. 6d., 3s. 9d., 2s. 11d., and 4s. 6d.?

As has already been indicated earlier in this chapter, this type may be worked in two steps, (*a*) addition, (*b*) subtraction, or by a single process which we have called "addition and subtraction in one operation" (see page 310).

The second kind of example will consist of a series of items on both sides of the account, and may be illustrated by the following.

A man banks the following amounts, £2 12s 6d., £3 17s. 6d., £15, £19 11s. 4d., and withdraws the following amounts: £17 10s., £12 2s. 6d., £1 18s. 5d., and £2 3s. 4d. How much is left in the bank?

Accounts of this kind occur in every walk of life—personal expenditure, household expenditure, clubs and societies, right up to budgets of local and national character, and it is fair, therefore, that children, even at the Junior stage, should have their attention drawn to this important type of calculation. Further, the moral aspect is not unimportant, and the necessity of "living within one's means," even the dire necessity of "making both ends meet," has a basis not only in will power but also in simple arithmetic.

Short Methods

In all the processes and topics referred to above, we have continually called attention to the possibility of short methods being used, and have advised that pupils should be encouraged to look for, and even to invent, suitable short methods, wherever possible. We now propose to discuss some of these methods in greater detail.

(*a*) DOZENS

These short methods are based upon the fact that 12 pence are equal to 1 shilling. From this it is easy to proceed from the price of 1 to the price of 12, merely by thinking of the pence as shillings, e.g.—

Price of 1	*Price of* 12
1d.	1s.
3d.	3s.
1s. 1d.	13s.
2s. 6d.	30s.
etc.	etc.

At the second stage we may introduce halfpennies and farthings, e.g.—

Price of 1	*Price of* 12
1½d.	1s. 6d.
2¼d.	2s. 3d.
6¾d.	6s. 9d.
1s. 2½d.	14s. 6d.
etc.	etc.

This simple "trick" may be extended to dozens and even to gross. Thus all the following may be worked "mentally"—

1. Find the cost of 2 dozen at 2d. each.
2. Find the cost of 6 dozen at 1½d. each.
3. Find the cost of 8 dozen at 3¼d. each.
4. Find the cost per gross at 1¼d. each.

Another extension of the device is to be found in its use for calculating costs of 11 or 13, or of 23 or 25, etc.

EXAMPLE. Find, mentally, the cost of 13 articles at 3¾d. each.

Clearly the cost of 12 is 3s. 9d.; and the cost, therefore, of 13 is 3s. 9d. + 3¾d. or 4s. 0¾d.

Similarly, the cost of 25 at 6½d. each is 13s. (2 dozen) + 6½d. (1), i.e. 13s. 6½d. Nor does this exhaust the possibilities of the device, for it clearly can be applied to examples of the following type—

Find the cost of 5 dozen articles at 5 for 6d.

This is seen at once to be actually identical with: "Find the cost of 12 at 6d. each."

All the above examples (with the exception of those involving such numbers as 11, 13, and 25) may be reversed, to give examples of the following type—

1. Find the cost of 1 where 1 dozen cost 7s. 6d.
2. Find the cost of 1 where 3 dozen cost 13s. 6d.
3. Find the cost of 1 where 1 gross cost 18s.

(*b*) SCORES

Short methods based upon the fact that 20 shillings make 1 pound become important in dealing rapidly with the prices of hundredweights and tons, for, since it is obvious that if 1 costs 5s. then 20 will cost £5, it follows that coal at 5s. per cwt. will cost £5 per ton. Accordingly all the following are capable of rapid mental evaluation—

1. Find the cost of 20 when 1 costs 2s. 6d.
2. Find the cost of 20 when 1 costs 1s. 9d.
3. Find the cost of 20 when 1 costs 3s. 3d.
4. Find the cost of 1 when 20 cost £2 10s.
5. Find the cost of 1 when 20 cost £3 15s.
6. Find the cost of 1 when 20 cost £4 7s. 6d.
7. Find the cost per ton at 2s. 9d. per cwt.
8. Find the cost per cwt. at £3 2s. 6d. per ton.

(*c*) OTHER SIMILAR SHORT METHODS

Methods similar to those given for dozens and scores may be based upon other simple relationships, such as—

£1 = 40 sixpences = 240 pence = 480 halfpence = 960 farthings.

These provide plenty of examples (of a slightly more artificial nature) for rapid mental calculation, such as the following—

1. Find the cost of 40 articles at 1s. 6d. each.
2. Find the cost of 40 articles at 2s. 9d. each.
3. Find the cost of 39 articles at 3s. 6d. each.
4. Find the cost of 41 articles at 4s. 9d. each.
5. Find the cost of 240 articles at 7½d. each.
6. Find the cost of 240 articles at 1s. 2¼d. each.
7. Find the cost of 239 articles at 4½d. each.
8. Find the cost of 241 articles at 3¾d. each.
9. Find the cost of 480 articles at 2¼d. each.
10. Find the cost of 960 articles at 1s. 1¼d. each.

All these are readily calculated "at sight," using the relationships stated at the head of the paragraph.

(*d*) SHORT METHODS BASED UPON 19s. 11d., 9s. 11d., 1s. 11d., ETC.

Sums of money such as these provide great scope for short methods.

(1) *Addition*

EXAMPLE. Add £5 17s. 6d. and 19s. 11d.
This clearly is (£6 17s. 6d.) – (1d.) i.e. £6 17s. 5d.
Similarly (£4 5s. 9d.) + (9s. 11½d.) is clearly (£4 15s. 9d.) – (½d.), i.e. £4 15s. 8½d.

(2) *Subtraction*

By similar reasoning—

(£5 17s. 6d.) – (19s. 11d.) is
(£4 17s. 6d.) + (1d.) or £4 17s. 7d.
and (£4 5s. 9d.) – (9s. 11½d.)
is (£3 15s. 9d.) + (½d.) or £3 15s. 9½d.

(3) *Multiplication*

EXAMPLE. 19s. 11d. × 13
This is easily seen to be (£1 × 13) – (1d. × 13), i.e. £13 – (1s. 1d.) or £12 18s. 11d.

Other examples which may be worked similarly are—

1. £3 19s. 8d. + £1 19s. 11d.
2. £4 5s. 6d. – £2 19s. 11d.
3. 11½d. × 28.
4. 9s. 11d. × 33.
5. 11¾d. × 100.
6. 4s. 11½d. × 36

(*e*) MISCELLANEOUS SHORT METHODS

The methods illustrated above do not exhaust the possibilities of shortening the labour of calculation in dealing with English money, and teachers and pupils should be constantly on the watch for ingenious methods which do not of necessity conform to any type. We illustrate a few of these miscellaneous methods, to conclude this section.

1. Add together 21 times 13s. 7d. and 21 times 16s. 5d.
This is clearly given by 21(13s. 7d. + 16s. 5d.) or 21 × £1 10s.

2. From 35 times £2 3s. 5d. take 35 times £1 17s. 11d

This, by similar reasoning, is given by—

35 (£2 3s. 5d. – £1 17s. 11d.)
or 35 (5s. 6d.),

which again is easily evaluated as—

(35 × 5s.) + (35 × 6d.)
or (£8 15s.) + (17s. 6d.)
or £9 12s. 6d.

3. Add together 17 guineas, 17 pounds, and 17 shillings.
By similar reasoning this is given by
17(£1 1s. + £1 + 1s.) or 34 guineas,
i.e. £35 14s.

These examples show an easy and convenient use of the simple algebraic identity—

$$ab \pm ac \pm ad = a(b \pm c \pm d).$$

Akin to these are examples of the following kind—

Multiply £14 15s. 7d. by 29 and use your answer to find answers to—

(*a*) £15 15s. 7d. × 29.
(*b*) £14 16s. 7d. × 29.
(*c*) £14 15s. 6d. × 29.

Having ascertained by ordinary calculation that £14 15s. 7d. × 29 = £428 11s. 11d., it follows—

(*a*) that £15 15s. 7d. × 20 is given by (£428 11s. 11d.) + £29.
(*b*) that £14 16s. 7d. × 29 is given by (£428 11s. 11d.) + (£1 9s.).
(*c*) that £14 15s. 6d. × 29 is given by (£428 11s. 11d.) – (2s. 5d.).

Teachers will at once note that, as soon as the pupil has reached reasonable proficiency in ordinary multiplication of money, it is possible by variations indicated above to set an infinite variety of new examples (all based on the original) to be worked by the shortest "intelligent" methods. We have, perhaps, indicated enough of these short methods to show the vast field for originality and enterprise which is available In the average class easier examples will be used.

The "Pence" Table

Ability to change readily from pence to shillings or from shillings to pence is required in practically every money calculation.

In the older days, when greater stress was laid upon *memorizing* all possible facts of instruction, much importance was attached to the learning by heart of the "pence" table, and it is probably true to say that in nearly every school the memorizing of this table preceded all formal work in money sums. Indeed, many teachers insisted upon the memorizing not only of the *pence* table but also of the *shillings* table and the *farthings* table, and many quaint rhymes exist in school books of a bygone age which attempt to "fix" these tables in the mind and memory of the pupil.

As regards the "pence" table it has long been customary to teach this as a series of multiples of 12 and 10, i.e.—

12 pence are 1s.
20 " " 1s. 8d.
24 " " 2s.
30 " " 2s. 6d.
36 " " 3s.
. . . .
144 " " 12s.

and certainly those who *did* commit this table to memory as children have undoubtedly found it advantageous in later life. In actual "sums," however, it appears to be of real use only in addition and multiplication of money, and even in these processes it is not really necessary since money addition, as we have seen, can be performed "through the shillings" instead of first adding and then "reducing" the pence, and the reduction necessary in a multiplication sum can readily be performed in the "margin" by division by 12. Accordingly, teachers to-day do not rely quite so implicitly upon the preliminary memorizing of the "pence" table, but rather depend upon a multitude of miscellaneous examples to "fix" the multiples of 12 in the mind of the pupil, so that he readily recognizes that 43 pence is (36 + 7) pence, i.e. 3s. 7d., and does not have to repeat the "pence" table up to "40 pence are 3s. 4d." as in the old "mechanical" days.

Mental Arithmetic

It has long been recognized that this term is a specific term popular with teachers, and that *all* arithmetic is really mental in the wider sense. Teachers, however, readily understand by this term Mental Arithmetic that type of arithmetic which can be readily performed "in the head" without the necessity of using writing materials.

For a long time the prevalence of large classes compelled this work to take the form of *oral* arithmetic only, answers being obtained by the time-honoured method of "hands up." It is now recognized that this is not the only, nor the best, form of mental arithmetic, and most good teachers prefer the method of "dictation" or working from "graphed" or printed examples. In this way each child works individually and quietly, and *answers only* are written down. The advantages of this individual method over the older mass method of "hands up" are obvious. A further and considerable advantage from the teacher's point of view is that the examples dictated or "graphed" can be carefully prepared and preserved, thus leaving him less at the mercy of the random inspiration of the moment.

As used at present in schools, mental arithmetic has two main aspects. It looks *backward* in its use for the revision of previous "rules" and "tables," and it looks *forward* in its use for simplifying the approach to new rules and problems. Both aspects are of the greatest importance, and should be so regarded and used regularly by the teacher. Mental arithmetic in this sense does not differ in essence from written arithmetic, and the teacher, accordingly, who regards it as an isolated separate subject of instruction, consisting wholly of a series of mechanical tricks and devices, is in danger of robbing his pupils of the greater part of the benefits of mental arithmetic properly taught. Further, mental work properly related to written work should be the means of reducing the amount of marginal work in written examples which so often appears to be so unnecessarily copious.

Mental arithmetic will also arise spontaneously in the course of some "activities," which give it immediate practical significance.

Class Work and Correction

Since the disappearance of slates and annual examinations, practice in arithmetic is now usually based upon some class-books of exercises, amplified where necessary by additional mental and mechanical examples supplied by the teacher. These books are usually good and some are excellent, and it is therefore, sad to note that some teachers will not give sufficient time to the exploration of the books available.

Fig. 4

Shopping in India

(*Editorial Note* The coinage in common use in India (3 pie = 1 pice; 4 pice = 1 anna; 16 annas = 1 rupee). This is said to have given rise to the English expression "I don't care a rap" (*Rupee, Anna, Pice*).
In a drawer full of old Indian coins at the British Museum it was noticed that they were coined in different parts of India, and marked to show this: it is an interesting point that, in imposing his own coinage on the conquered the conqueror is using it as a *means of propaganda*.)

Mathematical ability, even in a class of 40 or 50 pupils differs so widely that it is impossible to keep all working at the same examples at the same pace. This is now generally recognized, and the days when the teacher was content with the daily four sums—three mechanical and one problem—have disappeared for ever. Some head teachers have carried out successfully a wholesale re-grouping of all pupils for arithmetic, and most class teachers now divide their classes into sections for this purpose. The newer type of class-books, with their copious and refreshing variety of examples, usually provide far more work than the average pupil can possibly accomplish in any one year, but by this very defect they enable the wise teacher to make a judicious selection suitable for any type of class, group, or pupil.

The subject of correction has been admirably dealt with in the *Handbook of Suggestions*: while we have rightly reduced the amount and complexity of the written work demanded of the child, it is essential that what is done, should fulfil its purposes—

> In arithmetic, as in all written work, systematic correction is of the greatest importance, and children should learn from their mistakes. Written exercises must be scrutinized both in regard to logical statement—there is no reason why a sum well written out should not be read with as little difficulty as is experienced in reading a piece of well written English—and to accuracy. It is not sufficient to discover merely whether sums are right or wrong. Where errors are due to misunderstanding the question, or to faulty reasoning, or to unsuitable arrangement of the work, the children, either individually or in groups, may need some help from the teacher before they are able to rectify their mistakes, but slips in calculation can, as a rule, be discovered and corrected by the children themselves. *It is not an adequate substitute for individual correction for the teacher to work through all the sums on the blackboard regardless of the number in the class who have already obtained the correct answer.*

The italics of the last sentence are ours, for the practice here condemned is still widespread among teachers. It is clear that correction is a joint effort of teacher and pupil—the teacher indicating *what* is wrong and the pupil discovering *how* it may be put right.

Revision

It needs no emphasis here to observe that revision in arithmetic is as important during the Junior years as at any other stage. The danger of "age-group" or "standard" grouping is that in any one year the teacher may be so engrossed with the syllabus for the current year that the rules and exercises taught and practised in the earlier years are entirely overlooked. This has been a common criticism of children at the Secondary stage . . . "it is not uncommon to find children in upper classes failing—somewhat ignominiously—when tested in work which they appeared to have mastered some two or three years earlier" (*Handbook of Suggestions*). If this fault is to be avoided it is essential that revision exercises shall be regular, constant, and comprehensive. They must be given at the beginning and at the end of every period—term or year—as well as at intervals during the period, and no class-book should be chosen which is not plentifully bespattered with suitable revision exercises.

But there is a simpler kind of revision to be practised in every example. No sum should be offered to the teacher by the pupil as correct until it has been carefully revised, checked, or "proved." This habit of carefully checking and revising all calculations is one which is useful throughout life, and it should accordingly be practised from the outset. Many successful teachers have further insisted that each answer obtained shall, if possible, be compared with a "rough" or approximate answer previously obtained. Thus—

> In the example 19s. 10½d. × 37, the pupil would first write down, R.A. (Rough approximation). Answer must be less than £37.
>
> Similarly in the example £9 12s. 5d. ÷ 5 he would write down, R.A. Answer is less than £2.

This practice, coupled with careful revision or "proof" after the example has been worked, should reduce to a minimum the number of errors and the consequent amount of correction necessary.

Conclusion

We have now discussed at length the teaching of money rules and problems in the Junior School. The test of our success will be found in the ability of our pupils to take up readily the further work in money sums which will be developed in the Secondary School. If teachers are in doubt as to what standard of attainment is possible with Juniors in dealing with money sums, they should examine very carefully the tests set by leading authorities in their examination of candidates for scholarships and free places. These questions will indicate the ability of the best pupils, and teachers will be able to judge how far the average product of the Junior School conforms to this standard.

THE TEACHING OF WEIGHTS AND MEASURES

THE teaching of English weights and measures, with the calculations and problems involved, has always been a very formidable task for teachers in English schools. In other days it was customary to crowd as much as possible of this work—mainly in the form of "tables" and "sums," especially reduction sums,—into the old "Fourth Standard," which would correspond roughly to the last year in a modern Junior or Primary school. To-day, the work is more commonly spread over several years of the Junior course and the sums involved do not comprise the huge mechanical examples of former days, but consist of examples much more nearly approaching the circumstances of everyday life, involving quantities and numbers well within the comprehension of the pupil. As a result, the treatment has become definitely more practical and concrete and the mechanical drudgery has been correspondingly lessened, though the necessity for memorizing the important units and relationships, as set out in the various tables, remains as great as ever, provided that we are careful to omit those units and "measures," which are obsolete or very seldom used.

The practical concrete method of approach is especially important at the earliest stages, since the various units, if they are to be really understood, should be known as real things, and not merely as words or names in a table. As examples of these concrete methods we cannot do better than quote two passages from a prewar edition of the *Handbook of Suggestions for Teachers*—

> 1. Exercises in "shopping" render coins, weights, and lengths familiar; measurement of the schoolroom, the playground, the desks, etc., will give ideas of length; the drawing of square inches, square centimetres, etc., give ideas of area; the making and handling of blocks and cubes will give ideas of volume. The weighing of a gallon of water serves to connect the ideas of capacity and weight. Such measurements may frequently be preceded by rough *estimates, for* this practice affords a training which is likely to be of importance in life.
>
> 2. The apparatus for the use of concrete methods should not be expensive or elaborate. Many of the articles needed, such as foot-rules, squared paper, etc., are already to be found in any well-equipped school, and many more can be made at a small expense by the children themselves. For example, a set of weights can be prepared from lead, or by filling bags with sand, and it is possible to construct a rough balance which will serve for the measurement of weights down to an ounce or even less.

From the above, the importance of these practical, concrete approaches to all the tables will be grasped. If the work is to be anything more than mere word-knowledge in a world of unreality, it is essential that *all* the common units should be approached as realities, so that we shall no longer produce a race of children who can diligently reduce a million inches to miles, and yet fail to give a reasonable estimate of the width of a table, or the height of a post in feet.

With these introductory remarks, we pass at once to the discussion of each of the ordinary tables in English weights and measures.

The Table of Length

In the old days of learning by heart, the whole of this table was memorized, with no distinction between its units or their use. The sums which followed were mainly the compound "rules," i.e. addition, subtraction, multiplication, and division of length, together with reduction sums which generally involved the use of the whole of the table from inches to miles or even leagues.

The modern teacher begins differently. He (she) recognizes that inches, feet, yards, etc., are actual lengths—to be known and recognized as lengths—and not merely words in a table. Accordingly, all the preliminary work aims at teaching our pupils the actual use of such units, as well as the methods of manipulating them in sums. Further, the modern teacher recognizes that the table as a whole is not homogeneous, but that each unit and its near neighbours are used with some special significance, and that, for all general purposes, it will suffice if our pupils have a thorough knowledge of inches, feet, yards, and miles, other units such as furlongs, chains, and poles being of less general importance. We shall, accordingly, consider the measurement of length rather as a number of useful units than as a table.

Feet and Inches

These may be introduced at a very early stage. Some teachers, indeed, through the medium of the foot-rule, introduce inches and feet almost as soon as the pupil has grasped the composition of the number 12. Using a simplified ruler or scale, showing clearly feet and inches, without too many perplexing subdivisions, it is possible to devise endless exercises in drawing, measurement and simple calculation by which the pupils will readily grasp not only the relation of these two units but also the inch and the foot as actual real intervals of space, so that they can, with practice, estimate the width of a book or of a piece of paper accurately in inches, or the height of a door, etc., in feet. In this work, estimates and measurements are as important as sums, and it should constantly be borne in mind that in ordinary life measurements are never *purposeless* but are usually preliminary to some other calculation, such as quantities or costs. Accordingly, each measurement should be accompanied as far as possible by a calculation. Simple examples are here given—

1. Measure and write down the length of this paper. If this paper is cut lengthwise into 24 strips, how long a line could you make with the strips?
2. Measure and write down the length of this pencil. If I use half an inch every week, how long will it be before there is only one inch left?

Even more important are *eye-estimates* of lengths, widths, etc., e.g.—

"Write down what you *think* is the width of this paper. Then measure it to find out how far you are right." In this connection, competitions in length-estimating akin to those popular competitions in guessing the weight of a cake or a pig may usefully be introduced.

Yards

From inches and feet to yards is a simple transition. Eye-estimates of yards may prove more difficult for young pupils, but the yard-stick or measuring-tape should be regularly employed. Many schools have a yard-length painted in a conspicuous position in the classroom or school for ready reference, while, for longer distances, string knotted at intervals of a yard may be used. Simple mental calculations will abound at this stage, especially in changing rapidly from inches to feet, feet to yards, and *vice versa*. Here, again, pupils should be able to proceed directly from inches to yards when necessary, i.e. they should know that $1\frac{1}{2}$ in. × 36 is equal to $1\frac{1}{2}$ yd., and that $\frac{1}{36}$ of 15 yd. is 15 in.

Miles, Furlongs, Chains, Poles

Here the important unit is the mile, together with the half-mile and the quarter-mile, for these undoubtedly are the units most used in ordinary life. Furlongs, chains, poles, though important for sums, do not occur frequently in the pupil's experience. It is not difficult to make the mile a reality to children, for in these days of cheap and rapid road transport they are probably all familiar with the ordinary mile-posts which mark our main roads. Further, they readily grasp the fact that a normal adult at a customary pace would walk a mile in 15 min. while a normal boy would take 20 min. The relations between these various units are more difficult, because they are apparently so arbitrary, but the introduction of some reference to the history of these units will enable the numbers to be grasped as rational, though admittedly somewhat awkward. Thus, the furlong (or furrow-long—a convenient unit for ploughing) was known also as the acre's length (220 yd.), while the chain was known as the acre's width (22 yd.), a rectangle 1 furlong long and 1 chain wide, containing (220 × 22) or 4,840 sq. yd. The pole ($5\frac{1}{2}$ yd.) is clearly a quarter of the chain (22 yd.) and probably represented the longest actual pole or measuring rod which could be conveniently used in the measurement of land. Nautical units, such as fathoms and knots, always interest boys, and, in this connection, it is important to note that a knot is actually a *speed* and not a distance, i.e. a speed of 1 knot actually means a speed of 6,080 ft. *per hour*.

Having discussed the units as realities, we may proceed to the manipulation of these units in formal calculations and problems.

Formal Calculations in Length

Pupils should be able to add, subtract, multiply, and divide very simple lengths expressed in two or three units, such as feet and inches; yards, feet, and inches; miles and furlongs; or miles, furlongs, and chains. They should also be able to work simple examples of concrete division as in the example: "How many lengths of 4 ft. 3 in. can be cut from 20 yd. of material, and what length is left?" In addition to these simple calculations in length, much attention was formerly devoted to "reduction," as a means mainly of teaching the table of length. The cautionary advice of the *Handbook* is worth quoting in this connection—

> Reduction is an unfortunate consequence of our mixed system of units, and too much stress has often been laid upon it. If the common tables of weights and measures have been intelligently taught, simple steps in reduction present no great difficulty and it is seldom necessary to combine all the steps for such reductions as "tons to ounces," or "inches to miles" These reductions are not real, they necessarily involve large numbers and are principally useful as a test of accuracy.

This is sweeping, yet fair, criticism, since "mechanical" examples in reduction certainly occupied far too large a place in Junior arithmetic of other days. Actually, of course, few people in ordinary life *do* need all the units of the table. But, reduction as a process must still be taught and children must be proficient in changing units of one denomination to those of other denominations, particularly those of the next higher or lower denomination.

For the benefit of those teachers who consider that reduction in full must still be taught, we illustrate one or two alternative methods.

EXAMPLE. Reduce 2 m. 3 f. 4 ch. 5 yd. to yards.

1. *Traditional Method.*

Omitting the multipliers, this is usually arranged as set out on the right.

m.	f.	ch	yd.
2	3	4	5

19 f.
194 ch.
388
388
5
4273 yd.

2. *Alternative arrangement of* (1).

m	f.	ch.	yd.
2	3	4	5
	16	190	388
	19	194	388
			4273 yd.

3. *Multiple Method.*

1 mile = 1760 yd.	1760 × 2 =	3520
1 fur. = 220 yd.	220 × 3 =	660
1 ch. = 22 yd.	22 × 4 =	88
		5
		4273

Reduction to units of higher denomination is usually performed by continuous division, e.g. in proceeding from inches to miles, the divisors in order would be 12, 3, 22, 10, 8, or 12, 3, 5½, 40, 8, according as chains or poles were used in proceeding from yards to furlongs.

Occasionally, this continued division may be avoided by the use of larger multiples. We may illustrate this by the following example—

Change 15,000 yards to miles, etc.

	15000
1760	14080 = 8 miles
	920
220	880 = 4 furlongs
	40

i.e. 8 miles 4 furlongs 40 yards, or just over 8½ miles.

Problems in Length

Most of the examples now set in length appear in concrete form, and many are set in problem form. Examples of the application of length are so numerous in everyday life that it is seldom necessary to use artificial examples of the type: "Multiply 3 miles 4 fur. 5 ch. 6 yd. by 39." Further, since cost and length are so intimately associated in ordinary life, it is necessary to give examples frequently which will combine both money and length. Thus, pupils should proceed readily from the price per yard to the price per foot or per inch and *vice versa*, while they should delight in a reduction sum of the following type: "If a halfpenny is 1 in. across, what is the value of a line of halfpennies half a mile long?"

The Table of Weight

At the Junior Stage, the Table of Weight will be dealt with by methods identical with those employed in dealing with the Table of Length.

In the first place, we shall discard special methods of weighing, such as Troy Weight and Apothecaries' Weight. These may easily be acquired later in life by the few persons who will really need them, and they certainly have no place in a Junior syllabus. In the second place, we shall omit all unusual, obsolete, or variable weights such as "drams" and "stones" and shall concentrate our arithmetic upon the units in ordinary use, especially pounds and ounces, tons and hundredweights. "Quarters" may be introduced in real examples where they *do* occur in ordinary life, and stones similarly may be used in real cases, such as the weights of people, which are usually given in stones and pounds, but beyond this we shall not go. Above all, we shall refrain from *beginning* with the memorizing of the complete table—from drams to tons.

The Beginnings

As already indicated in dealing with feet and inches, we shall begin with the actual units, and our pupils, by means of some form of simple balance, will learn the meaning of pounds and ounces by actual use. Even hundredweights may be dealt with by practical methods where the school possesses (as it may do for purposes of medical inspection) a weighing machine. With this provision, pupils may, under supervision, perform simple exercises in weighing common objects and commodities.

With pounds and ounces, these exercises will gain in reality if associated with shopping and the school shop. Further, the pupils may usefully make acquaintance by these means with other important units, such as *half-pounds* and *quarter-pounds*. As a handwork exercise, each pupil may, if necessary, by means of sandbags or shot-bags, construct his own set of weights and may thus discover that it is not necessary to construct 15 separate weights for weighing up to 15 oz., but that the weights, 1 oz., 2 oz., 4 oz., 8 oz. are sufficient for this purpose. The commodities weighed will usually be "dry," either in powder form or in very small pieces, [illegible] at some time during the child's Junior School life, opportunity should be found for weighing liquids such as a pint of water or a pint of milk. But the enthusiastic teacher will invent endless interesting weighing exercises and calculations based upon them, so that in the end the pupil will be familiar with pounds and ounces as actual weights, and will be able to perform simple calculations, including costs associated with them.

Some General Remarks on the Table of Weight

We have already indicated the approach to pounds and ounces. Tons and hundredweights, from their magnitude, do not lend themselves to similar practical treatment, but they may be made more real to the pupils if associated with coal and coke. The homely sack of coals, in hundredweights or half-hundredweights, is a common object in our streets and homes. The most difficult transition for the pupil to make is from pounds to hundredweights and the arbitrary nature of the number 112 is always somewhat mystifying to young pupils. The difficulty is not entirely removed if the intermediate units, stones and quarters, are used, but may be partly explained if the teacher is able to indicate the historical steps by which the *hundred*weight (presumably originally one *hundred* pounds) gradually settled down permanently to its present form of 112 lb. As an exercise in factors, it is useful to note that 112 contains numerous pairs of factors such as 2, 56; 4, 28; 7, 16; 8, 14; and pupils can deduce for themselves that one *quarter* of 1 cwt. obviously contains 28 lb.

As soon as the units are familiar to the pupils, it is essential that their numerical relations should be firmly fixed, not merely in "table" form, but in "equivalent" form. Thus, the pupil should know thoroughly such correspondences as—

1 ton = 20 cwt. = 80 quarters = 2240 lb.
1 cwt. = 4 quarters = 112 lb.

The transition from ounces to tons is seldom required, but is easily obtained as 1 ton = (2240 × 16) oz.

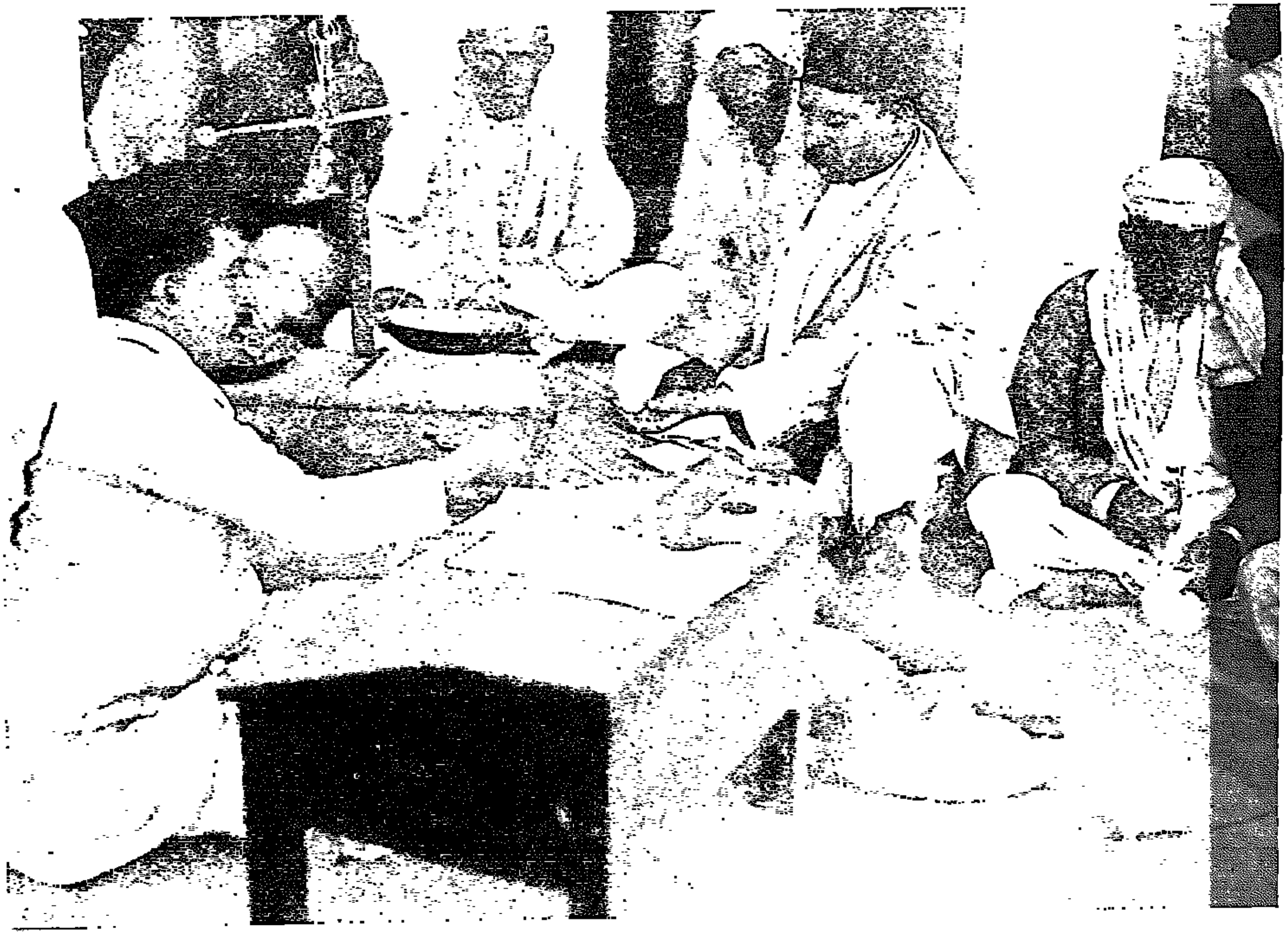


Fig. 5

Payment for Cotton

Weight Calculations and Problems

Simultaneously with the above practical work many opportunities will have been found for simple calculations in connection with weights, and pupils will have added, subtracted, multiplied, divided, and "reduced" simple weights, preferably expressed at first in not more than two units, such as pounds and ounces, or tons and cwt. These may later be extended to three units, such as tons, cwt., qr., or cwt., qr., lb. It is important to note that few people use the whole of the table and that, while the coal merchant deals mainly with tons and cwt., the butcher and grocer are chiefly concerned with pounds and ounces. Long reductions from ounces to tons, or from tons to ounces, accordingly have an arithmetical rather than a real-life value, and, because of this fact, they should be sparingly used. Where such examples *are* set (as they *will* be set occasionally, for practice and revision), the method of *multiples* is frequently preferable to the more traditional method of continued multiplication. We may illustrate this by an example—

Reduce 3 tons 11 cwt. 3 qr. to lb.

Using the correspondences indicated above, we first set down in column form the value of 1 ton, 1 cwt., 1 qr., in lb. The answer is then obtained by simple multiplication and addition, e.g.

(1 ton) 2240 × 3 = 6720
(1 cwt.) 112 × 11 = 1232
(1 qr.) 28 × 3 = 84
8036

The most cumbersome reduction of all is involved in the conversion of lb. to cwt. or cwt. to lb., and little can be done to lighten the labour. Actually, however, the larger multiples used above may be utilized, especially if the common multiples such as 224, 336, 448, 560, etc., are known. We illustrate by examples—

1. Express 1,000 lb. in cwt. and lb.

Here, clearly, 1,000 lies between 896 and 1,008, i.e. between 8 cwt. and 9 cwt. Actually, it will be seen that 1,000 lb. is only 8 lb. less than 9 cwt., and the answer accordingly is 8 cwt. 104 lb. A further application of the "multiple" method gives this finally as 8 cwt. 3 qr. 20 lb.

2. Express 300 lb. as cwt. qr. lb.

Deducting 224 lb., the first step gives us 2 cwt. 76 lb. Taking the 76 lb. and deducting 56 lb., we have finally as our answer: 2 cwt. 2 qr. 20 lb.

This method clearly depends upon a ready knowledge of the larger units and relationships.

Concrete division, which depends so largely upon reduction will at this stage, of course, receive attention, but care will be taken to make the examples as simple and as real as possible.

Weights and Costs

Even more important than the manipulation of weights in sums as indicated above, is the connection of weights and costs. In the first place, the pupil should be able to proceed from the cost of one unit to the cost of another, e.g. from the cost per ounce to the cost per lb., and in the second place, he must be able to calculate simple costs, such as 3 lb. 9 oz. at 8d. per lb., or 2 tons 7 cwt. at £1 10s. per ton. All these, in simple form, can be introduced to Junior pupils. We indicate a few interesting methods which may be used.

1. Find the cost of 27 lb. at 5d. per lb.

This *may* be done by ordinary reduction, but is much more readily done by the method of simple Practice, e.g.

27 lb. at 1d. per lb. = 2s. 3d.
27 ,, 5d. ,, = 11s. 3d.

What we have actually done here is to use the simple algebraic identity that—

5d. × 27 = 27d. × 5.

The advantage of the method will be seen in such an example as 6¾ lb. at 11d. per lb., which is identical with 11 lb. at 6¾d. per lb.

From cost per ounce to cost per lb. is a simple step. Thus—

¼d. per oz. = 4d. per lb.
½d. ,, = 8d. ,,
¾d. ,, = 1s. ,,
1d. ,, = 1s. 4d. ,,

Innumerable other costs may be deduced from these, e.g.—

Cost per lb. at 1¼d. per oz. = 4d. × 5 = 1s. 8d.
Cost per lb. at 3½d. per oz. = 8d. × 7 = 4s. 8d.
Cost per lb. at 11d. per oz. = 1s. 4d. × 11 = 14s 8d.

The reverse process is equally simple, where it applies. Thus—

3s. 4d. per lb. = (4d. × 10) per lb. = (¼d. × 10) per oz.
= 2½d. per oz.
14s. per lb. = (4d. × 42) per lb. = (¼d. × 42) per oz.
= 10½d. per oz.

An alternative device which is frequently useful is that of halving and doubling, e.g.—

Cost per lb. at 7½d. per oz. = 16 × 7½d.
Now 16 × 7½d. = 8 × 15d.
(halving and doubling)
= 10s. per lb.

To proceed from cost per lb. to cost per cwt. is more difficult, but a useful link is the following—

Cost of 1 cwt. at 1d. per lb. = 9s. 4d.

From this, it follows that—

Cost of 1 cwt. at ½d. per lb. = 4s. 8d.
and cost of 1 cwt. at ¼d. per lb. = 2s. 4d.

These may be applied to simple cases, such as—

Cost of 1 cwt. at 5d. per lb. = 9s. 4d. × 5
Cost of 1 cwt. at 3½d. per lb. = 4s. 8d. × 7
Cost of 1 cwt. at 2¾d. per lb. = 2s. 4d. × 11.

Prices of tons and cwt. give but little trouble. These have already been mentioned in connection with money rules. The analogy: 20 shillings = £1, and 20 cwt. = 1 ton provides useful working rules for costs. Thus, 2s. 3d. per cwt. is clearly £2 5s. per ton, and £3 10s. per ton is clearly 3s. 6d. per cwt. More complex calculations, such as finding the cost of 4 tons 17 cwt. at £3 7s. 6d. per ton may be reserved until the Senior stage and will then be treated under the heading of "Practice."

We have indicated above such parts of the arithmetic of weight as may reasonably find a place in the syllabus of the Junior School. For actual examples of what is possible in both Mental and Written Arithmetic in this subject, we must refer our readers to any modern series of class-books, such as the well-known *Common-Sense Arithmetic for Juniors.*

The Table of Capacity

It is this table, perhaps more than any other, which has been sensibly simplified in its treatment in the modern Junior School. Gone are the mysteries of "Dry Measure," "Ale and Beer Measure," and "Wine and Spirit Measure," with their pottles, firkins, hogsheads, puncheons, pipes, and tuns, and all that are left of this once formidable array are the simple measures of pints, quarts, and gallons, with occasional reference to pecks and bushels. Thus simplified, the table of capacity, with its rhythmical alternation, of 2, 4, 2, 4, i.e. 2 pints = 1 quart, 4 quarts = 1 gallon, 2 gallons = 1 peck, 4 pecks = 1 bushel, is the easiest table to commit to memory, of all the English weights and measures.

As in the tables already discussed, the common units, pints, quarts, and gallons, may be made familiar to the pupils through actual use and measurement, and children can determine the approximate capacity of ordinary household and other vessels. They should readily recognize such things as quart-, pint-, or half-pint jugs, glasses, and bottles, while two-gallon jars and two-gallon petrol tins will be familiar to many pupils. Further, as already mentioned in connection with the table of weight, pupils should at some time or other attempt to find the weight of a pint or a gallon of water.

Calculations and problems which are confined to this table alone are not often set, but the units of capacity are frequently set in connection with other tables, as in the following examples—

A household uses 3 pints of milk daily. Find the cost of this milk at 3s. 4d. per gallon for the last three months of an ordinary year.

A milkman delivers 29 pints and 42 half-pints of milk daily. How many gallons and pints does he deliver in a week?

Formal calculations, especially reductions requiring the conversions of pints to bushels, etc., need seldom, if ever, be set to Junior pupils. All that is necessary at this stage is that the calculations and problems shall be real, and that the numbers shall not be unwieldy.

Time and its Measurement

In dealing with Time and its measurement, we cease to be dealing with measurements and units which are peculiarly English, and are using a table which is international, at least throughout the civilized world. This description certainly applies to the ordinary units of seconds, minutes, hours, days, and weeks, which are regulated by movements in the solar system. The subject is of major importance, for time, its measurement, its lapse, and its cycles of months and years, is of such vital importance to every human being that it cannot merely be dismissed as a subject suitable only for reduction sums.

So far as Juniors are concerned, we may at the outset attempt to set forth what we think they ought to know in this important subject. In this connection, teachers mostly agree with the following—

1. Pupils should be able to "tell the time," and read a clock-face easily, whether in Roman or ordinary figures.
2. They should be able to reckon ordinary times of day, i.e. the number of hours, etc., from 8.30 a.m. to noon, etc.
3. They should know the difference between times a.m. and times p.m.
4. They should be able to read a simple railway or other time-table.
5. They should know the order and the lengths of the months.
6. They should know what years are leap years.
7. They should be able to reckon *dates*, i.e. if 15th November falls on a Monday, they should be able to give the day of the week upon which 1st December will fall.
8. They should know certain fixed dates of the calendar, such as Christmas Day, Armistice Day, etc.

It will be seen from this list that "Time" is a matter of general knowledge rather than of sums, and it is unfortunate that we can still find pupils in their Secondary years who can diligently reduce seconds to years according to rule, and yet are totally unable to read an ordinary railway or bus time-table, to reckon the date of, say, two weeks next Monday or the day of the week upon which the first day of the next month will fall or to appreciate "Summer Time."

Telling the Time

Practice in "telling the time" is now begun at a very early age. A clock-face with movable hands is all that is necessary, and this will enable the teacher to set exercises of both the following types—

(*a*) What time does the clock-face show?
(*b*) Arrange the hands so as to show the time "ten minutes to nine," etc.

Many incidental facts will be acquired during these simple exercises, such as that sixty minutes make an hour; that the "face" shows these minutes by convenient intervals of five, e.g. 5, 10, 15, 20, 25, etc.; that a quarter of an hour is 15 min., and that half an hour is 30 min., etc.; and that a day consists of twice 12 hours.

The transition from the reading of the time in colloquial phrase from a clock or watch to the interpretation of times as usually set out in time-tables presents some difficulties. Thus, the pupil who can readily read such times as ten minutes to nine or ten minutes past nine from a timepiece, finds considerable difficulty, at first, in recognizing these times in their new guise of 8.50 and 9.10, while the necessary addition of "a.m." or "p.m." still further complicates the process, and many children fail altogether to interpret such an example as the following—

Find the number of hours and minutes between 8.50 a.m. and 2.25 p.m.

This new notation must be thoroughly known if time-tables are to be readily and accurately interpreted, and it may accordingly be necessary to give plenty of "drill" of the following nature—

(*a*) Write the following as it would appear in a time-table: Seven minutes to ten. (9.53.)
(*b*) What is the ordinary meaning of 9.45? (A quarter to ten.)

From these times and their simple notation, we may proceed at once to ordinary railway or bus time-tables. In this work, care should be taken to present such a time-table in the simplest possible form, but with this precaution endless exercises are possible, all of which may be cast in the most interesting of forms. Thus, in dealing with the daily time-table of trains between e.g. London and Leeds, all the following, and many other, exercises may be set.

(*a*) How long does the —— train take from London to Leeds?
(*b*) What is the fastest train in the day from London to Leeds or Leeds to London?
(*c*) What train must I take from London to be in Leeds not later than 2 p.m.?
(*d*) What is the shortest time in which I can go from London to Leeds and back?
(*e*) The —— train arrived at Leeds 35 minutes late. At what time did it arrive?
(*f*) A man left Leeds for London by the —— train and returned the same day by the —— train. How long was he in London?

(*g*) How much time is spent in "stops" by the —— train?
(*h*) What is the average speed in miles per hour of the —— train (either including or excluding "stops")?

Many of the above exercises will involve the manipulation of times, especially the subtraction of times. Accordingly, it may be necessary to give plenty of drill in examples of the following type—

How many hours and minutes are there—

(*a*) Between 8.30 a.m. and 11.45 a.m.?
(*b*) Between 9.45 a.m. and 11.30 a.m.?
(*c*) Between 11.30 a.m. and 1.45 p.m.?
(*d*) Between 11.45 a.m. and 2.10 p.m.?
(*e*) Between 3.10 p.m. and 1.40 a.m.?
(*f*) Between 6.30 p.m. and 10.15 a.m.?

The converse types are equally important, e.g.—

What time is it which is—

(*a*) 3 hours later than 11.30 a.m.?
(*b*) 2½ hours later than 1.45 p.m.?
(*c*) 2 hours 25 min. later than 10.45 p.m.?
(*d*) 4 hours earlier than 2 p.m.?
(*e*) 3½ hours earlier than 4 p.m.?
(*f*) 2 hours 45 min. earlier than 6.10 p.m.?

Other Simple Exercises in "Times"

Time-tables alone do not exhaust the possibilities of exercises in reading times. Every almanac contains copious material. Thus, the pupil may determine the length of daylight from sunrise to sunset for different days of the year, from the longest to the shortest. He may also determine "lighting-up" times for motorists and cyclists. Again, tide-tables and times of high tides become of absorbing interest at the seaside or river-mouth, while everywhere the times of the rising of the moon and the dates of its "changes" are of interest. All these, as we have noted, are matters rather for general knowledge than for sums of the ordinary type, and many of the examples will require very little written work. What is really required is a series of useful mental problems for rapid calculation.

In connection with times "a.m." and times "p.m." the pupil ought to learn at some time, possibly the Secondary stage, that the "twenty-four hour" railway time-table has many advantages, and removes all the difficulties of "a.m." and "p.m." Thus, the difference between 9.30 a.m. and 2.30 p.m. becomes obvious when expressed as the difference between 9.30 and 14.30. We should do well, therefore, to give our pupils some practice in examples of both the following kinds—

(*a*) Express 3.30 p.m. in "Continental" form (15.30.)
(*b*) What English time corresponds to 17.15? (5.15 p.m.)

The Calendar

This subject, though hardly applicable to ordinary sums, must receive careful attention. In the first place, the pupils must know the sequence and the lengths of the months. This has traditionally been taught by some form of rhyme, and it is in this form that most adults remember it. From this, examples may be set such as the following—

1. Find the number of days in the last three months of a year.
2. Which is the longer six months in an ordinary year—January to July or July to January?
3. Which is the longest quarter in an ordinary year?
4. When could there be fifty-three Sundays in an ordinary year?

Further, the pupil must be familiar with leap years and their recognition.

The fact that 365 is factorizable into 73 × 5 is sometimes made use of in examples of a rather artificial type involving "fifths" of a year, but this particular fact is hardly worth memorizing.

Much more important is the ability to reckon dates. Examples of this kind are frequently very difficult for pupils, and should accordingly receive careful attention. We indicate a few of the most useful types—

1. How many days are there from 17th January to 14th February? (It is usual to reckon in one but not both of the given dates, i.e. to reckon from, say, noon on the 17th January to noon on the 14th February.)
2. What date is thirty days later than 9th March?
3. What date is exactly seven weeks earlier than Christmas Day?
4. *If 1st March falls on Sunday, on what day of the week does 1st April fall in the same year?*

All the above examples may be varied indefinitely and will be found to give the most useful practice in this part of the subject.

Time and Money

Unlike most of the other tables, the cases in which time and money are associated are very few, with the exception of the topic of wages per hour, and accordingly not many varieties of sums are possible. Children may, however, calculate weekly earnings from given rates per hour, if the hours worked daily are supplied, e.g.

> A man works from 8.30 to 12 and from 1.0 to 5.30 daily from Monday to Friday, and from 8.30 to 12 on Saturdays. What does he earn per week at the rate of 2s. 3d. per hour?

Weekly wages or weekly rents will also provide a number of examples based upon the fact that 52 weeks make a year. (It should, of course, be remembered that actually it is 52 weeks and 1 day or 2 days, according as we have 365 or 366 days in the year.) In this connection, it is useful to remember that 5s. per week is £13 per year, whence many other correspondences may be deduced, such as that a rent of £40 per year is roughly 15s. per week.

Time and money may occasionally be usefully mixed in reduction examples as in the following—

> A hospital's expenses are equal to 2d. per second. What is this per week and per year?

Time and Distance—Speeds

In the connection between time and distance, we have a mathematical subject of the utmost importance. So far as Junior pupils are concerned, the subject will always refer to *uniform* motion, and this will be usually (but not always) in *miles per hour*.

Miles per Hour

The conception is simple—uniform motion—distance covered in miles per hour. Calculations and problems of every kind are possible—

> EXAMPLE. Speed of 60 miles per hour.
> (*a*) What distance is this per minute?
> (*b*) How far will a train travel at this speed in 2¼ hours?
> (*c*) How far will a train travel at this speed between 9.30 a.m. and 11 a.m.?
> (*d*) How long would a train take to travel 200 miles at this speed?

Varieties of all these, and many others, may be set upon one simple speed.

The converse type, the calculation of speeds in miles per hour, is equally important and will appear in many forms both easy and difficult, e.g.—

> (*a*) A train travelled 20 miles in 25 minutes. What was its speed in miles per hour?
> (*b*) A cyclist travelled 220 yd. in 1 minute. What was his speed in miles per hour?
> (*c*) An aeroplane travelled 225 miles in 2¼ hours. What was its speed in miles per hour?
> (*d*) Which is the greater speed: 100 yards in 1 second or 200 miles an hour?

In this connection we may repeat that a knot or nautical mile is a *speed* and *not* a distance. Thus, we may speak of a ship travelling "at 12 knots," but not "at 12 knots per hour." Pupils may later learn how to change approximately from knots to miles per hour. A knot is fixed by statute as 6,080 ft. A mile is 5,280 ft., and the ratio of a knot to a mile is clearly 6,080 to 5,280, which is roughly 8 : 7. It follows that we may convert knots approximately to miles by adding on $\frac{1}{7}$, i.e. 28 knots is approximately 32 miles per hour. Conversely, we may change miles per hour to knots by deducting $\frac{1}{8}$, i.e. 40 miles per hour is approximately 35 knots.

The relation between speeds expressed in miles per hour and their equivalents in feet per second or yards per minute is rather difficult for Juniors, and only the most advanced of our pupils will readily make this transition. On the other hand, the "standard rate," as we may term it, of 60 miles per hour is easily convertible into yards per minute or feet per second, i.e. 60 miles per hour = 1 mile or 1,760 yd. per min., or 88 ft. per sec., and from these correspondences many other very useful correspondences may be deduced.

Concluding Remarks on Time and its Measurement

We have indicated enough, we hope, to convince teachers that those who confine their arithmetical examples in this subject to the reduction of seconds to years and similar exercises are missing by far the most important aspects of this subject, even at the Junior period.

Unfortunately, it will not be possible to proceed far, in dealing with pupils below the age of eleven, with the fascinating astronomical and historical aspects of time and the calendar, but teachers who are interested will find ample material in any good encyclopaedia or in Chapter IX of the *Teaching of Arithmetic* (Sir Isaac Pitman and Sons, Ltd.).

Area and Square Measure

In approaching the table of Area and Square Measure, we are dealing with a subject which is in some ways the most important of all. The table, from square inches to acres or square miles, is the most complex one encountered so far, even if we omit such units as roods and poles and proceed direct from square yards to acres. Further, the table to-day is associated with many forms of practical work—measurement and calculation—which are included under the generic term "mensuration." We shall, accordingly, first offer a few remarks on the various units used in the measurement of area, and afterwards indicate how these units may be taught by means of suitable practical work of every kind.

The Square Inch

This is fundamental. Inch squares should be cut in cardboard or paper and handled by every pupil. In this way, they may discover for themselves that 144 sq. in. actually cover an area of 1 sq. ft.

The Square Foot

This may be handled similarly and pupils may discover in the same way that 9 sq. ft. are equal to 1 sq. yd.

The Square Pole

Much time and labour were formerly spent upon this unit, especially in reductions which demanded multiplication or division by the awkward number 30¼. A simple drawing exercise will show unmistakably that a square pole of 5½ yd. side *does* contain 30¼ sq. yd. and the pupils may discover this for themselves by drawing a square pole to some simple scale, such as 1 in. = 1 yd.

From poles through roods to acres is more difficult to demonstrate simply, but an easier approach to the acre is, as we have already seen (p. 324), through the square chain.

The Square Chain

The area of a square chain, by definition of a chain, is clearly (22 × 22) or 484 sq. yd., and 10 such square chains will cover 4,840 sq. yd. or 1 acre. Alternatively, a strip 10 chains (or 220 yd.) long, and 1 chain or 22 yd. wide, will have an area of 1 acre. This historical connection of the furlong with the acre's length, and the chain with its width will be found to be the simplest approach to the acre for young pupils.

The Square Mile

It follows from the above description of an acre as a strip 1 furlong long and 1 chain wide, that 640 such strips arranged in 80 rows of 8 strips will cover 1 sq. mile.

Little can be done with younger pupils to teach the actual significance of these larger units, and, accordingly, many teachers of Juniors prefer to confine their attention mainly to the smaller units, such as square yards, square feet, and square inches, leaving the larger units to be met in more detail at the Secondary stage. Where it is really necessary to change square yards to acres, it is usual at this stage to proceed with simple division by 4,840.

Example. Change 20,000 sq. yd. to acres, etc. The older method would proceed by successive division by 30¼, 40 and 4 according to the table. The newer method will proceed by division by 4,840, first simplified by cancelling: e.g.

$$\frac{20000}{4840} = \frac{2000}{484} = \frac{500}{121}$$

Whence the answer is seen to be $4\frac{16}{121}$ acres, or approximately 4⅛ acres, which is in a form readily understood by farmer or landowner.

But we leave this "land" measure and turn to the simpler units involved in the measurement of area.

Area and its Measurement

Area is a new conception in mathematics for our young pupils, and we must accordingly approach it, not in the old abstract way, by definition and the "table of square measure," but by incidental methods of the most practical and concrete nature. In so doing, we are laying the necessary foundation for that great body of school arithmetic known traditionally as *Mensuration*. The methods by which mensuration was formerly taught are well known. They consisted almost entirely of a deductive treatment by which a "rule" or formula was memorized and then "applied" to appropriate examples. To this rather formal approach modern teachers have added an *inductive* approach to the rule or formula, by which the pupil as far as possible discovers *for himself* the constitution of the formula, or the reason for the rule. This induction is usually made as practical and concrete as possible. Further, as soon as the rule or formula is developed, it is applied not merely to sums, as set in the ordinary textbook, but to actual practical examples. We may illustrate by the following—

Traditional. Find the area of a piece of paper 4 in. long and 2½ in. wide.

Modern. Find the area of *this* piece of paper (or table-top or frame, etc.), the object being supplied without measurements.

The difference is seen at once. The second example is practical in the fullest sense, for it depends not merely upon correct calculation, but upon the accurate measurement of the length and width of the object, and the pupil learns that most useful of lessons, viz. that accurate calculations, however carefully performed, are valueless if based upon inaccurate dimensions.

The early lessons on area and its measurement will take many interesting forms. Thus, pupils may draw and cut out inch squares in paper or cardboard; they may ascertain the approximate area of some simple rectangular surface by the actual use of these inch squares; they may "discover" how the area may be quickly calculated by simple multiplication of the numbers representing the length and the width, and they may apply this simple rule to any suitable surfaces.

At first the areas will be rectangular only, but instances of these rectangular surfaces are innumerable and pupils should, by actual measurement of suitable objects, become familiar with the simple units, square inches, square feet, and square yards, their connections, and their place in simple calculations.

We have already indicated above that, in our opinion, the examples or sums should be both with and without any data. Actually, of course, more sums *apparently* can be worked if the data are supplied, and if the pupil has only to perform the calculations, but more real progress is made if the pupil occasionally has to deal with a "figureless" example, in which the figures upon which the calculation depends have first to be collected by careful measurement.

The Importance of Drawings and Diagrams

Many good teachers insist from the first that all examples in area shall be illustrated by drawings, either freehand sketches or more careful drawings made with a ruler, as far as possible to scale. The practice is excellent, for many problems become almost self-evident as soon as a sketch is made. Moreover, the work links up with the use of plans and maps in history and geography, and in class or group projects. Most modern textbooks and class books now include examples based upon diagrams.

So important is this drawn work that teachers are advised to give this necessary practice in the making and reading of diagrams regularly, from the earliest Junior years. Elaborate drawings to scale may be beyond the ability of ordinary Junior pupils, but much simple work may be done, even at this stage. Thus, we have found that exercises of the following type are not beyond the capacity of Juniors.

1. If 1 in. represents 10 yd., draw lines to mean 20, 30, 25, 35, etc., yd.
2. If this line (given) represents 30 yd. draw another line to mean 20 yd.
3. If 1½ in. represents 15 miles, how many miles is this to the inch?
4. If the scale is 1 in. = 10 miles, what does *this* line (given) represent?

From practical work in linear examples such as these, the transition to simple area examples is easy, e.g.—

1. Draw the plan of a garden, 40 yd. by 25 yd., using the scale 1 in. = 10 yd.
2. What is the actual length, width, and area of this rectangle? (Shown on a plan drawn to an easy scale.)

In all this practical work—mensuration—drawing—measurement and calculation—examiners constantly report that girls show less ability in this subject than boys. These reports are so frequent and so widespread that there seems no reason to doubt their truth. Many reasons for this difference of ability in boys and girls may be adduced. It may be that the difference is innate, constitutional or physiological; it may be that the subject appeals less to girls than to boys, or that less time is available for it in girls' schools. Finally, it may be possible that women teachers, as a whole, do not teach this more practical arithmetic *quite* so well as men teachers. But, whatever the cause of the difference, it is now increasingly recognized that the subject is equally as important to girls as to boys, and certainly at the Junior Stage there should be no difference in the treatment of boys and girls in dealing with this part of the subject.

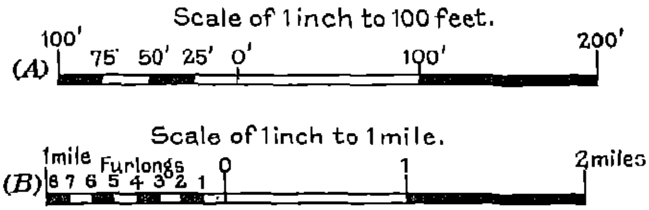


FIG. 6

Scales in Common Use

The History of English Weights and Measures

In our treatment of English weights and measures given above, we have indicated several times the possibility of making our teaching more real and more interesting, as occasion offers, by reference to the *history* of some of the common units, and we now desire to develop this historical approach a little more fully. At sight, it is admitted that our English tables of weights and measures present what appear to be most extraordinary incongruities, complexities, and absurdities, when compared with the smooth simplicity of a decimal or metric system. It is true that modern teachers, less bound perhaps by "codes" and examinations than teachers of a former generation, are steadily rejecting the obsolete and lesser-used units, but even the common units which are left gain immeasurably in interest if looked at from their historical aspect. Teachers who are interested may attempt the following questionnaire—

1. Why do we use the symbols £ s. d. for pounds, shillings, and pence?
2. Has the penny always been a *copper* coin?
3. When did guineas cease to be actual coins of the realm?
4. Why was the gold £1 coin (in use before the Great War) called a *sovereign*?
5. Is it an accident that the same word *pound*, is used as the name of a unit in both money and weight?
6. What is the history and derivation of the words *inch, foot, yard*, as applied to length?
7. What is the historical connection between the furlong and the acre?
8. Is there any historical connection between the English mile and the Roman "mille"?
9. What is the origin of the term "knot" as applied to speeds at sea?
10. Why is the hundredweight written *cwt.* and yet contains 112 lb.?

These questions indicate but a few of the points of extraordinary interest which underlie our seemingly fantastic series of weights and measures. Local and variable weights and measures are another fascinating study for those who are interested, though these will seldom be introduced into calculations. It will be found, however, that practically every "trade" that handles goods or commodities, especially foodstuffs, fruit, and vegetables, has its own particular units, some of which are quite unknown to the general public.

The growth of our calendar, with its months of varying lengths, its fifty-two weeks and an odd day, or two odd days in a leap year, its "Bank-holidays," its "Quarter-days," and other fixed dates, comprises, amid these perplexities, a vast amount of most interesting historical, mathematical, and astronomical information, and teachers will find, if they will delve into some of these things, that they will rapidly amass a wealth of interesting information which will lighten the labour of their pupils in attempting to commit seemingly arbitrary facts to memory.

The Syllabus in Weights and Measures for the Junior School

We have indicated, above, the work which we believe to be possible in the Junior School in this subject of weights and measures. We may finally view this question of a possible syllabus from an entirely new angle, and examine the type of question that has been set to young pupils of about the age of eleven by examiners for entrance to Secondary Schools.

An examination of a large number of such test papers has led us to the conclusion that what we have already outlined is not an impossible syllabus for normal children between the ages of seven and eleven or over. A closer examination also reveals the fact that very few "mechanical" questions of the older type now appear, but that problems of every simple type abound. Practical work, involving actual measurements and drawing is, of course, very difficult to "test" in this way, but examiners have reached a useful compromise in that most of them have included questions based upon the reading of a sketch-plan or simple drawing. A few questions selected from examination papers, which will indicate quite clearly what is possible with the best of our pupils, and will thus point indirectly to a desirable standard for Junior School arithmetic, at its highest level, in this subject of weights and measures, are given below.

Mental—Answers only to be Written Down

1. How many lengths of 3½ yd. are there in 21 yd.?
2. What is the distance round a room 12 ft. 6 in. long and 10 ft. wide?
3. A wheel turns three times in 15 yd. How many times will it turn in 40 yd.?
4. A square piece of paper measures 1 ft. round its edge. What is its area?
5. A sideboard 5 ft. wide stands in the middle of a wall 14 ft. wide. What width of the wall is on either side?
6. If 1 in. on a map represents 100 miles, how many miles do 2¼ in. represent?
7. What is the distance round a square of area 25 sq. in.?
8. How many packets of ¾ lb. each can be made out of 4 lb. 8 oz.?
9. If 5 halfpennies weigh 1 oz., find the weight of 5s. in halfpennies.
10. How many parcels of 9 lb. can be made from 1 cwt. and what weight is left?
11. What is $\frac{5}{12}$ of 3 cwt?
12. How long does a man work from 7.30 a.m to 6 p.m. if he is allowed 2 hours for meals?
13. How far will a train travel in 24 minutes at 30 miles per hour?
14. A train starts at 3.15 p.m. and stops at 4.8 p.m. How many minutes is it running?
15. A watch loses 5 seconds per hour. How much is this per day?
16. If 1st December is a Monday, on what day of the week will Christmas Day fall?
17. What will 3 pints cost at the rate of 2s. per gal.?
18. What is the area of a piece of paper 10 in. long and 6½ in. wide?
19. How many squares of 3-in. side can be drawn on 1 sq. ft. of paper?
20. A sixpence is placed on every inch square of a piece of paper 1 ft. long and 5 in. wide. What is the value of the money?

Written

1. How many pieces each 1 yd. 1 ft. 3 in. long can be cut from 50 yd. of string and what length is left?
2. If a halfpenny is 1 in. across, what is the total value of a line of halfpennies 1 mile long?
3. 60 posts are placed in a line at intervals of 55 yards. How far is it from the first to the last post?
4. If 3 pennies weigh 1 oz., find the weight of £10 in pence.
5. A grocer charged for 2 lb. 10 oz. instead of 2½ lb. His charge was thus 3½d. too much. What was the price per lb.?
6. After paying for 2½ lb. of butter, a woman received 5s. 5d. change out of 10s. What change would she have received if she had bought 3½ lb.?
7. Find the total cost of 5 pints of milk daily during the month of July at 9d. per quart.
8. A watch stopped at 8.15 a.m. At 10 a.m. it was restarted, but the hands were not put right. What time did it show at 5 p.m. in the same day?
9. At 12 noon a man had walked a quarter of his journey. He rested for half an hour and then finished his journey at 3.30 p.m. At what time did he start?
10. A motorist travelled 20 miles at 20 m.p.h., 20 miles at 25 m.p.h., and 20 miles at 30 m.p.h. What was his average time for 1 mile?
11. Find the total area of all the faces of a rectangular wooden block, 1 ft. long, 6 in. wide, and 4 in. thick.
12. A square foot of paper is cut into strips 1½ in. wide. What is the total length of all the strips?

Teachers who are interested are recommended to try the above examples with a good "A" division of pupils nearing the end of their last Junior year.

FRACTIONS AND DECIMALS IN THE JUNIOR SCHOOL

Fractions

Introductory. To mention fractions in connection with Arithmetic at the *Junior* stage would have been considered to have been most unusual a generation ago, for fractions at that time were dealt with only at a later stage, beginning with very formal and difficult examples in L.C.M. and H.C.F., followed by the formal "rules" and simplifications at about the age-level of the old "Standard V." Further, when once begun, fractions and simplifications were pursued relentlessly and remorselessly to their uttermost complexities. This formal and formidable treatment of fractions still persists in some schools, and with it there arise inevitably other evils and bad habits of calculation, to which we shall draw attention as this article proceeds.

That this older method of treatment persisted in our schools is shown by the following quotation from the *Handbook of Suggestions* (1927 Edition).

> It is probable that the ordinary school treatment of vulgar fractions is too elaborate: too much time may easily be spent in their manipulation, and more particularly in the simplification of long complex fractions Also, when fractions with large denominators are avoided, there remains no reason for setting the difficult questions in L.C.M. and H.C.F. to which undue attention is often paid. Questions in L.C.M. and H.C.F. which cannot be solved by the inspection of factors may well be deferred or entirely omitted.

These strictures, while they may still be true of some *Secondary* Schools, do not directly apply to the work in the *Junior* School, where the introductory work and the practical and concrete applications of fractions can neither be too numerous nor too elaborate, but they certainly point out what may very properly be avoided even at the Junior stage. If we read the above extract thoughtfully we shall see at once that by implication we are enjoined to make our work in fractions at all stages *simple*—simple fractions, simple denominators, and simple applications. Complex fractions, clumsy denominators, and all such absurdities and perplexities should be everywhere discarded or avoided, even if they are still found occasionally in textbooks and examination papers. It is accordingly with these general principles in mind that we proceed to discuss the teaching of fractions in the Junior School.

Fractions v. *Decimals*

It has been customary in the past for fractions to be treated fairly fully in our schools before decimals are dealt with at all. In former years this practice was general, but of late years teachers are beginning to find that fractions of both kinds, vulgar and decimal, may, by proper methods, be introduced at a very early age, and may be developed gradually through the Junior School, so that, by the time the more formal "rules" and processes are dealt with, a satisfactory groundwork has been laid. Some teachers are found who will even insist that the teaching of the simplest decimals should *precede* instead of follow the teaching of fractions. The same view of the balance of attention to the two allied subjects of fractions and decimals is well set out in the above *Handbook of Suggestions*.

> It is the traditional practice to study vulgar fractions before decimals. To a certain extent this plan is sound, for *halves* and *quarters* are easier than the easiest decimals, but, once the beginner can deal with these very elementary vulgar fractions, there is no reason why he should not study decimals before occupying himself with vulgar fractions of a difficult kind. Vulgar fractions with large denominators are cumbersome and of limited utility, whilst decimals are comparatively easy to handle, and have many practical applications

The remainder of this article should be construed in the light of the advice given in the above extract, and it should be understood that the treatment of fractions and decimals, here of necessity outlined in consecutive form, should, in schools, be treated concurrently as far as possible. Fortunately, modern class-books of arithmetic (such as the well-known series of *Common-Sense Arithmetic* Books) *do* adopt this concurrent treatment, so that pupils using them may make progress almost simultaneously, in each of the Junior years, in both vulgar and decimal fractions.

The Earliest Stage

We have, in the introductory remarks above, urged that the teaching of fractions can, and indeed should, be begun at a very early age. On this point the above-quoted *Handbook of Suggestions* spoke with no uncertain voice—

> Children may become acquainted with the simplest fractions at a very early stage. Fractions are approached in the Infants' School; children become familiar with the fractional notation in working sums in halfpennies and farthings. By means of handwork involving measurement they can extend their use of the notation and can learn to see that a fraction such as $\frac{3}{4}$ is greater than $\frac{5}{8}$ without actual manipulation of figures: it can also be made apparent to them that $\frac{3}{4}$ is equal to $\frac{6}{8}$ without first learning a rule for the purpose. Later on, with the aid of squared paper or a ruler an easy addition sum such as $\frac{1}{2}+\frac{1}{5}=\frac{7}{10}$ can be illustrated. Similarly, it is easy to devise exercises to show that $\frac{2}{3}$ of $\frac{7}{10}=\frac{7}{15}$ and so on.

The lead here given is clear and definite, and we propose to develop step by step the various possibilities of this preliminary treatment of fractions.

Notation

It has been pointed out that in the writing of farthings and halfpence in the forms $\frac{1}{4}$d., $\frac{1}{2}$d., $\frac{3}{4}$d. the pupil at a very early stage becomes acquainted incidentally with the ordinary notation of fractions. This notation and the allied subject of fractional numeration may be further extended by many varieties of handwork and practical arithmetic, such as paper cutting and folding, the use of squared paper and squared blackboards, ruler gradations, and simple drawing and measuring exercises of every kind. The simplest fractions fall very naturally into easy groups, such as halves, quarters, eighths; thirds, sixths, ninths, and twelfths; fifths and tenths; and it is with these that the introductory exercises will usually begin.

Halves, Quarters, Eighths

Meanings for the simple fractions such as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ will be found on the ruler-edge, and by simple exercises involving drawing and measurement of lines and areas. Applications may be made to any kind of concrete quantity including money. Thus the pupil should be able to give the value readily of such quantities as $\frac{1}{4}$ of 1s. or $\frac{1}{2}$ of 10s., etc. Further, he may discover for himself that one half is actually two quarters, or that three quarters is actually six eighths, thus meeting with the fundamental rule of fractions, which is that any fraction may be expressed in an infinite number of forms (e.g. $\frac{1}{2}=\frac{2}{4}=\frac{4}{8}$, etc.). From these "aliquot parts" $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ he may proceed to the more complex, such as $\frac{3}{4}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$. Incidentally, without learning any formal rules for manipulation of fractions he may discover for himself such facts as $\frac{1}{2}+\frac{1}{4}=\frac{3}{4}$, or $\frac{1}{4}+\frac{1}{8}=\frac{3}{8}$, or $\frac{1}{2}$ of $\frac{1}{4}=\frac{1}{8}$, or that $\frac{3}{4}\div\frac{1}{4}=3$. All these facts, for instance, may be clearly demonstrated by the use of a square piece of paper divided, by drawing, into four smaller equal squares. They may also be clearly demonstrated on the edge of a ruler, or by the drawing of lines, or by any other method which the ingenuity of the teacher may devise. Practice may be given in *estimating* fractional lengths, e.g. the child may be asked to *estimate* three-quarters of a given length, the estimate afterwards being checked by measurement.

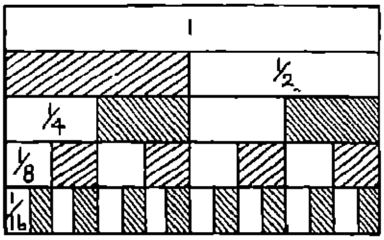


FIG. 7
A Diagram for Demonstrating Fractions

Thirds, Sixths, Twelfths

These will readily lend themselves to the methods described above. In particular the foot-rule with its twelve inches will form a valuable illustration. Numerous simple correspondences will be explored, such as $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$, or $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$, or $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$, or $\frac{1}{2} \div \frac{1}{6} = 3$.

These fractions may be linked with the halves and eighths by the exploration of such relations as $\frac{1}{3} - \frac{1}{12} = \frac{1}{4}$, or $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$, or $\frac{2}{3}$ of $\frac{3}{4} = \frac{1}{2}$, and others. In every case the simple facts should be discovered from concrete illustration or fractional work.

Ninths, though allied to this group, will need special treatment, particularly the relation of thirds and sixths to ninths.

Fifths and Tenths

These form a third group of simple introductory fractions. The pupil will discover, by drawing, measuring, or observation that $\frac{1}{5} = \frac{2}{10}$, or $\frac{1}{2} = \frac{5}{10}$, or that the fractions already dealt with cannot be exactly expressed in "tenths." Later he may, in his introductory decimals, discover that "tenths" and a different kind of notation have very definite uses which are not readily apparent when they are thought of merely as vulgar fractions.

If this preliminary exploration of the notation and meaning of these simple fractions is carefully and patiently done by the teacher and pupil conjointly, by "blackboard" work, classwork, and individual work, a solid foundation will be laid for the future work. In particular it will be noted that we have so far made no mention of such technical terms as numerator and denominator, nor do we believe that there is the slightest need for the introduction of such terminology to pupils in the earliest stages.

Applications of the Above

In the above preliminary explorations the pupil will have encountered many simple applications, particularly to money, weights, and measures. Thus he will have applied most of the above fractions to pounds or shillings or both, and will be able to give, or to find, such quantities as $\frac{3}{4}$ of £1, or $\frac{2}{3}$ of 1s., or $\frac{3}{5}$ of 10s., and others. Further, in the simplest costs he will be able to find such costs as $2\frac{1}{4}$ lb. at 1s. per lb., or $2\frac{3}{4}$ yd. at 2s. per yard. In general he may, by these newer methods, gain a good acquaintance with the meaning, writing, and use of simple fractions.

Practical work with the simpler geometrical figures may be used periodically to demonstrate the validity of the more formal work. In the upper classes the measurement of angles may be used as the basis of many interesting exercises in decimals and fractions, and will be a valuable foundation not only for those children who are going on to Technical and Grammar schools, but also for others who are later to learn a skilled trade.

Improper Fractions and Mixed Numbers

Sooner or later the pupil must be brought into contact with the quantities to which the above terms are applied. Usually he finds little difficulty in recognizing that $1\frac{1}{4}$ is really *five* quarters, and may accordingly be written $\frac{5}{4}$. Accordingly pupils at this stage may receive plenty of drill both in changing mixed numbers to improper fractions and *vice versa*. This work is usually very popular with young pupils, but care should be exercised at this stage that the denominators are not large, since a pupil who may readily appreciate that $2\frac{1}{8} = \frac{17}{8}$ may be unable to attach any real meaning to such a fraction as $2\frac{13}{16}$ or $\frac{45}{16}$.

Reduction to Lowest Terms—Cancelling

In this process we are dealing with the fundamental fact which is at the basis of all fractional manipulations. We have already indicated, above, that the pupil may discover for himself that $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$, etc. It is the *general* application of this principle of equivalence which must now receive attention, viz. that *every* fraction is thus capable of being expressed in an infinite number of ways. It follows that, if this is so, then for *any* fraction there is one and only one simplest form. The process by which we arrive at this simplest form is known as "reducing to lowest terms." The theory of fractions comprised in the above is the basis of the "rules" employed in addition and subtraction of fractions, while "reduction to lowest terms" and the allied operations known as "cancelling" are necessary in nearly all examples involving the multiplication and division of fractions. The basic principle that any fraction has an infinite number of forms, e.g. $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$, etc., can readily be demonstrated by drawing or paper-folding, or by the examination of a ruler-edge. The converse exercise of "reducing to lowest terms" requires a ready knowledge of factors and divisibility tests (see p. 304). In this connection the advice of a *Handbook of Suggestions* is helpful.

> Rapid practice in resolving numbers within the limits of the multiplication table into pairs of factors provides an effective method of revising tables, and splitting numbers into prime factors is a simple extension of this useful practice. The applications of the latter exercise are so numerous and useful, e.g. in "common measures," "common multiples" and "cancelling," that it deserves more attention than it generally receives . . .

No very great practice is needed to make even Junior children proficient in resolving small numbers at sight into their prime factors.

> At this stage, or later, as opportunity offers, the simpler tests of divisibility should be taught. For rapidity of work in "reducing to lowest terms" and in "cancelling," children will appreciate the advantage of knowing the tests of divisibility by 10, 5, 2, 4 and 8, and the simple rules can easily be made intelligible to them. The tests of divisibility by 3 and 9 should be taught, but the explanation of these rules is too difficult for most children . . .

Akin to this aspect of fractions is the comparison of simple fractions. Thus fractions such as $\frac{2}{3}$ and $\frac{3}{4}$ may easily be compared if they are first expressed as $\frac{8}{12}$ and $\frac{9}{12}$. Simple exercises of this kind should occasionally be set, and the more advanced pupils may be asked to arrange a series of fractions in order of magnitude by first expressing them in terms of a common denomination. Exercises of this kind lead directly to the use of the process of finding the L.C.M. of two or more numbers, a process which becomes of the utmost importance in formal addition and subtraction. This process was formerly taught as a rule, whereas, as we have noted earlier in this article, it should seldom be necessary to set fractions the manipulation of which require a common denominator which cannot be readily seen "at sight" or, at least, be ascertained by the use of factors.

In the above we have outlined briefly a possible course in preliminary fractions which may be begun as early in the Junior School as is thought desirable, and may be continued during one, two, or more years as necessary. For teachers who can find time for this introductory course we would again urge the necessity for the use of *simple* fractions, ample practical work, and concrete applications throughout.

Formal Processes in Fractions

For pupils who have passed through a suitable introductory course, as here outlined, the formal rules for adding, subtracting, multiplying and dividing fractions should present no real difficulties to the more able in the last Junior year: this is recognized in the examples of both "mechanical" sums and problems in fractions regularly included in papers formerly set in the examinations for Junior scholarships and Free Places. We shall accordingly discuss briefly each of these rules from the Junior School teacher's point of view.

Additions of Fractions

Any number of fractions can be added together if expressed in units of the same denomination. Thus we easily add together $\frac{1}{2}$ and $\frac{1}{3}$, if expressed in the form $\frac{3}{6}$ and $\frac{2}{6}$, and we obtain the answer $\frac{5}{6}$. We could equally well have added them together if expressed in the form $\frac{6}{12}$ and $\frac{4}{12}$, and should have obtained the answer $\frac{10}{12}$, but this would have necessitated the further reduction of $\frac{10}{12}$ to its lowest terms, i.e. to $\frac{5}{6}$. The rule is clear from this simple example, i.e. first express all the fractions to be added in terms of the same common denominator, and further, if unnecessary work is to be avoided, this denominator will be the *least* common denominator. Simple cases may be demonstrated using lines or rectangles, but children readily grasp the rule without much demonstration.

In working such an example as the following: $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$, it is customary to proceed as follows—

(i) L.C.M. of 2, 3, 4 = 12.

(ii) $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$

$$= \frac{6}{12} + \frac{4}{12} + \frac{3}{12} = \frac{13}{12} = 1\frac{1}{12}.$$

Most teachers shorten step (ii) as follows—

$$\frac{6 + 4 + 3}{12} = \frac{13}{12} = 1\frac{1}{12}$$

In Great Britain the work is usually set out horizontally, but a vertical arrangement is common in some countries. In this form the above example would appear as set out on the right

$$\begin{array}{c|l} & 12 \\ \hline \frac{1}{2} & 6 \\ \frac{1}{3} & 4 \\ \frac{1}{4} & 3 \\ \hline & 13 = \frac{13}{12} = 1\frac{1}{12} \end{array}$$

In Mixed Numbers the integers are usually added separately. Thus the example $1\frac{1}{2} + 2\frac{1}{3} + 3\frac{1}{4}$ would be worked at the second step as—

$$6\frac{6 + 4 + 3}{12} = 6\frac{13}{12} = 7\frac{1}{12}$$

With ordinary practice, addition of simple fractions should present no difficulty at the Junior stage.

Subtraction of Fractions

The basis of this rule is exactly the same as that for addition. Thus $\frac{1}{3}$ may easily be subtracted from $\frac{1}{2}$ if the fractions are first expressed in the form $\frac{3}{6}$ and $\frac{2}{6}$, and the answer is clearly $\frac{1}{6}$.

The work may be set out, as in the case of addition, either horizontally or vertically, i.e. (*a*) or (*b*)—

(*a*)

$$\frac{1}{2} - \frac{1}{3}$$
$$= \frac{3 - 2}{6}$$
$$= \frac{1}{6}$$

(*b*)

$$\begin{array}{c|c} & 6 \\ \hline \frac{1}{2} & 3 \\ \frac{1}{3} & 2 \\ \hline & \frac{1}{6} \end{array}$$

The subtraction of Mixed Numbers will introduce all the difficulties common to all forms of subtraction. We may illustrate by a simple example—

$$3\frac{1}{3} - 1\frac{1}{2}$$

This is usually dealt with by teachers in one of the following ways—

(*a*)

$$3\frac{1}{3} - 1\frac{1}{2}$$
$$= 2\frac{4}{3} - 1\frac{1}{2}$$
$$= 1\frac{8 - 3}{6}$$
$$= 1\frac{5}{6}$$

(*b*)

$$\frac{10}{3} - \frac{3}{2}$$
$$= \frac{20 - 9}{6}$$
$$= \frac{11}{6}$$
$$= 1\frac{5}{6}$$

(*c*)

$$3\frac{1}{3} - 1\frac{1}{2}$$
$$2\frac{2 - 3}{6}$$
$$= 2 - \frac{1}{6}$$
$$= 1\frac{5}{6}$$

Teachers should examine each of these impartially as to its comparative merits.

Here again arises the necessity for the careful co-operation between teachers in Junior and Secondary Schools, for it is unfair to the pupil that he should learn one method of subtracting fractions in the Junior School and a *different* method in the Secondary School.

Addition and subtraction of fractions are frequently required in the same example, as in the following—

$$4\frac{1}{3} - 3\frac{1}{2} + 2\frac{3}{4}$$

This is usually set out as follows, the integers being dealt with separately—

$$3\frac{4 - 6 + 9}{12} = 3\frac{7}{12}$$

In some examples the usual difficulty of negative quantities occurs, e.g.—

$$4\frac{1}{3} + 3\frac{1}{2} - 2\frac{11}{12}$$
$$= 5\frac{4 + 6 - 11}{12} = 5 - \frac{1}{12}$$
$$= 4\frac{11}{12}$$

Multiplication and Division of Fractions by Fractions

Children acquire these "rules" with extraordinary rapidity, and conscientious teachers find them most difficult to demonstrate, explain, or "prove" to their pupils. Demonstration is, of course, possible and easy in simple cases, but much time may be wasted, especially at the Junior stage, in trying to explain or demonstrate too much.

Multiplication

Multiplication by an integer is readily grasped. Thus the pupil who knows that $\frac{3}{4}$d. × 5 is $\frac{15}{4}$d.

or $3\frac{1}{3}$d. usually has no difficulty in seeing by the same reasoning that $\frac{2}{3} \times 5 = \frac{10}{3} = 3\frac{1}{3}$. These and similar truths may readily be demonstrated by simple drawing exercises in lines or areas. "Cancelling" makes its useful appearance even at this stage, for the pupil who argues from the fact that since $\frac{2}{3} \times 5 = \frac{10}{3}$, therefore $\frac{2}{3} \times 6 = \frac{12}{3}$ is correct enough, but has failed to reduce his labour by first "cancelling." From multiplication by integers to multiplication by fractions is not usually a difficult step, and here the pupil may make the usual discovery for himself that "of" and "×" are in this connection identical, i.e.—

$$\frac{2}{3} \text{ of } \frac{3}{4} \text{ is the same as } \frac{2}{3} \times \frac{3}{4}.$$

The meaning of $\frac{2}{3}$ of $\frac{3}{4}$ (or $\frac{3}{4}$ of $\frac{2}{3}$) is easily demonstrated in lines or rectangles, and the result may be compared with that obtained by the "rule" in working $\frac{2}{3} \times \frac{3}{4}$.

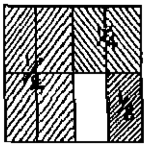


FIG. 8

A Simple Diagram for Demonstration

(e.g. $\frac{1}{4}$ of $\frac{1}{2}$, $\frac{2}{3}$ of $\frac{3}{4}$, $\frac{3}{4}$ of $\frac{2}{3}$)

It is another step to cause the pupil to realize that $\frac{2}{3}$ of 15s. may be worked (in shillings) as $\frac{2}{3} \times 15$ or 10, and in pounds as $\frac{2}{3} \times \frac{3}{4}$ or $\frac{1}{2}$.

Division

This rule is learnt and mechanically applied by pupils as readily as the rule for multiplication. The rule, i.e. "Invert the divisor and proceed as in multiplication", is perhaps the most difficult of all the fractional rules to explain. Simple cases may, of course, be easily demonstrated. Thus it is usually clear that $\frac{3}{4} \div 3$ is $\frac{1}{4}$, but it is not so clear that $\frac{1}{5} \div 3 = \frac{1}{15}$, unless we first express the fraction $\frac{1}{5}$ as $\frac{3}{15}$ when ordinary division is possible. Both these results may be obtained by the ordinary "rule," i.e. (*a*) $\frac{3}{4} \div 3 = \frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$; (*b*) $\frac{1}{5} \div 3 = \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$.

But the mere mastery of the rule, even at the Junior stage, is not sufficient. It is of the utmost importance that the pupils should be able to *apply* the rule to simple cases of every kind. We may illustrate by a few simple examples.

(*a*) "If $2\frac{1}{2}$ lb. cost 7s. 6d. what is the price per lb.?" This requires the fractional division of 7s. 6d. by $2\frac{1}{2}$—

i.e. Answer in shillings

$$= 7\frac{1}{2} \div 2\frac{1}{2}$$
$$= \frac{15}{2} \times \frac{2}{5} = 3\text{s.}$$

(*b*) "If a motorist travels 63 miles in 2 hours 20 minutes, what is his speed in miles per hour?"

This requires the division of 63 by $2\frac{1}{3}$—

i.e. Answer
$$= 63 \div 2\frac{1}{3}$$
$$= 63 \times \frac{3}{7}$$
$$= 27 \text{ m.p.h.}$$

(*c*) "How many people can have 3s. 6d. out of £1 11s. 6d.?" This requires the division of £1 11s. 6d. by 3s. 6d.

Working in shillings, this

$$= 31\frac{1}{2} \div 3\frac{1}{2}$$
$$= \frac{63}{2} \times \frac{2}{7}$$
$$= 9$$

(*d*) "How many books at 4s. 6d. each can be bought for £5 and what is left?"

Working in shillings, this

$$= 100 \div 4\frac{1}{2}$$
$$= \frac{200}{9}$$
$$= 22\frac{2}{9}$$

Hence the actual answer is 22, and $\frac{2}{9}$ of 4s. 6d. (or 1s.) left.

All forms of concrete division in money, weights, and measures may be worked by the methods illustrated in (*c*) and (*d*) above.

We have illustrated, above, the usual processes in the manipulation of fractions, and in doing so we have endeavoured to avoid clumsy denominators and complex fractions of every kind. If teachers of Juniors will only remember to keep to simple fractions we believe that they will be astonished at the amount and variety of the work which may be accomplished.

Simple Applications of Fractions

Two simple applications of fractions which must receive regular practice are—

(*a*) Finding a given fraction of a given quantity.

(*b*) Expressing one quantity as the fraction of another quantity.

Simple examples of these are—

(i) Find $\frac{3}{8}$ of 5s.

(ii) Express 8d. as the fraction of 1s.

Examples of type (i) may be worked by a variety of methods. We illustrate as follows—

(*a*) $\frac{3}{8}$ of 5s. $= (\frac{3}{8} \times 5)$s. $= \frac{15}{8}$s. $= 1\frac{7}{8}$s. $=$ 1s. $10\frac{1}{2}$d.

This is the simple application of the rule.

(*b*) $\frac{1}{8}$ of 5s. $= 7\frac{1}{2}$d. $\therefore \frac{3}{8}$ of 5s. $= 7\frac{1}{2}$d. $\times 3 =$ 1s. $10\frac{1}{2}$d.

This is proceeding by first principles, i.e. dividing by 8 and then multiplying by 3.

(*c*) $\frac{3}{8}$ of 1s. $= 4\frac{1}{2}$d. $\therefore \frac{3}{8}$ of 5s. $= 4\frac{1}{2}$d. $\times 5 =$ 1s. $10\frac{1}{2}$d.

This method depends upon a knowledge of aliquot parts.

Short methods should be encouraged wherever possible. Thus the example: "Find $\frac{9}{10}$ of 12s. 6d." should not be worked by any of the methods illustrated above, but should be worked by simple subtraction as follows—

	s.	*d.*
	12	6
$\frac{1}{10} =$	1	3
By subtraction $\frac{9}{10} =$	11	3

Similar methods may, of course, be used in multiplying by mixed numbers, i.e. £3 5s. × $2\frac{9}{10}$ is clearly the same as £3 5s. × $(3 - \frac{1}{10})$ or £9 15s. − (6s. 6d.) which gives £9 8s. 6d. as the answer.

The expression of one quantity as the fraction of another should give very little trouble. All that is necessary is that each quantity shall be expressed in units of the same denomination. Thus if the exercise is to express $4\frac{1}{2}$d. as the fraction of 1s., it is necessary first to express the denominator as 12 pence and then to simplify $\frac{4\frac{1}{2}}{12}$, i.e. $\frac{9}{24}$ or $\frac{3}{8}$.

As was suggested in the process of concrete division, much labour may be saved by a judicious selection of units. Thus the fraction $\frac{\text{1 ft. 9 in.}}{\text{1 yd.}}$ may readily be expressed as $\frac{7}{12}$ if the unit employed is 3 in. and not 1 in. If the latter is used, the fraction becomes $\frac{21}{36}$, which then has to be reduced to its lowest terms.

Numerous traditional problems in fractions are outside the scope of this work and are indeed out of place in any Junior syllabus, but typical examples are given at the end of this chapter which should not be beyond the abilities of the best pupils in Junior Schools.

Decimal Fractions

Decimal fractions, their meaning and manipulation, are on the whole not so well taught and understood in our Primary Schools to-day as are vulgar fractions. In former days their teaching was usually postponed until vulgar fractions had been exhaustively dealt with. We have already discussed this question in the section headed "Fractions *v.* Decimals" at the beginning of this article, and it is fair to say that modern teachers now introduce simple decimals, their meaning and notation, in the form of inches and tenths at a very early age, certainly as soon as the pupil is really launched on his career in the Junior School. This practice is strongly recommended in the *Handbook of Suggestions*, where we find the following—

> Decimals, if taught, will arise naturally as alternative notations for tenths and hundredths, and will be illustrated by ruler work. The treatment of hundredths,

> however, involves estimation on the ruler, and other apparatus may be preferred. Children should know the decimal equivalents of halves, quarters, and fifths.

This short paragraph expresses clearly and concisely the new approach to the teaching of decimals. All the apparatus necessary is a ruler gradated in inches and tenths, and some paper ruled in squares of one-tenth of an inch side. With these, endless simple exercises in drawing and measurement, with consequent calculations, are possible, in which the pupil will constantly be writing decimals of one place and adding, subtracting, multiplying, and dividing them as required, without learning any formal decimal rules, and with little or no reference to the corresponding vulgar fractions. For the astonishing variety of work which is thus possible in the Junior years the reader should turn to any modern series of class-books, such as the well-known *Common-Sense Arithmetic for Juniors* and *Mechanical Tests* (Pitman).

As soon as tenths are thoroughly familiar the pupil may explore the meaning of the second decimal place, or "hundredths." Here the teacher has two concrete aids at his disposal for illustration, for he may use either paper squared in inches and tenths or later he may use the metre measure showing decimetres and centimetres. Both of these show clearly a real meaning for a decimal of two places, and illustrate admirably the relation of tenths to hundredths. Thus on squared paper pupils can interpret, in terms of a square inch (as representing unity), such decimals as ·34, ·56, ·78, etc., while they may also discover such correspondences as ·25 = $\frac{1}{4}$, ·75 = $\frac{3}{4}$, or that $\frac{1}{5}$ is equal to 2 tenths or 20 hundredths, and that $\frac{1}{2}$, similarly, is equal to 5 tenths or 50 hundredths. On this same squared paper simple examples of decimals to hundredths may be added and subtracted, or multiplied or divided by whole numbers. Some teachers prefer to postpone the real exploration of the meaning of "hundredths" until they are dealing with metres and centimetres. But for Junior pupils the extension of inches and tenths to "hundredths" through the medium of squared paper ruled in inches and tenths, with which they are familiar, is probably preferable. These introductory methods preliminary to the study and manipulation of formal decimals will, in the hands of a sympathetic teacher, enable the pupil to grasp quite naturally many important points in the meaning and manipulation of decimals. They enable him in the first place to have visual and concrete images and meanings for the most important decimal values —tenths and hundredths. He will be able to manipulate these simple decimals without having learnt any "rules" or formal methods, and he will think of decimals directly *as* decimals and not indirectly through the medium of vulgar fractions.

But even the formal methods themselves are not beyond the abilities of the pupils in our best Junior Schools, and we shall accordingly discuss briefly the four rules in decimals so far as they may reasonably be taught to pupils of Junior School age.

Addition and Subtraction of Decimals

No new rules need be taught. All that is necessary is an extension of the principle "units under units, tens under tens" to "tenths under tenths" and "hundredths under hundredths," or, more simply, "decimal point under decimal point." With this precaution the rest is easy. In addition, a minor difficulty sometimes arises where two figures add to make ten, as in the examples (*a*) 2·4 + 3·6 and (*b*) 2·73 + 3·47. In these cases answers as 6·0 (*a*) and 6·20 (*b*) should not be criticized at first though the pupil should learn later that the zero need not be written in instances such as these where it occurs to the right after a significant figure.

Subtraction similarly presents few new features, provided that hundredths are subtracted from hundredths, tenths from tenths, etc. The difficulty mentioned above in connection with addition takes on a different form in subtraction in such examples as the following—

From 6·2
Take 3·74

Here the pupil may very properly *imagine* 6·2 in the form 6·20 even if he does not actually *write* it in that form. Indeed, the zero in this case is a very necessary prop for the working of the example.

Multiplication and Division of Decimals

These examples may involve the multiplication and division of decimals by integers or by decimals, and we shall accordingly discuss each in turn.

Multiplication by an Integer

This is identical with ordinary multiplication and the work is usually set out as seen on the right.

$$\begin{array}{r} 2{\cdot}34 \\ 7 \\ \hline 16{\cdot}38 \end{array}$$

Example: 2·34 × 7.

The difficulty of the zero figure at the right hand of the answer occurs in such examples as 2·34 × 5.

Working as before (see right) the answer appears as 11·70 or more usually as 11·7, but the occurrence of the 0 to the right will frequently cause wrong answers to be given.

$$\begin{array}{r} 2{\cdot}34 \\ 5 \\ \hline 11{\cdot}70 \end{array}$$

The particular case of multiplying by 10 or 100 is extremely important. Consider the example 2·34 × 10. Working as before (see right), the answer appears as 23·40 or more usually 23·4, whence arises the "rule of thumb" known shortly as "moving the point." Pupils readily learn this artifice, and will accordingly find no difficulty in such examples as—

$$\begin{array}{r} 2{\cdot}34 \\ 10 \\ \hline 23{\cdot}40 \end{array}$$

Find ten times each of the following decimals: (*a*) ·12, (*b*) 2·3, (*c*) ·3, (*d*) ·04.

While the notion of a "moving" decimal point is very convenient in such a process, it is perhaps better to regard the *figures* as moving to the left rather than the *point* as moving to the right, a fact which may easily be illustrated by means of the ordinary columns for hundreds, tens, units, tenths, hundredths, and so on. Thus (*b*) above, i.e. 2·3 or 2 units 3 tenths, becomes 2 tens 3 units when multiplied by 10.

Multiplication by a Decimal

This is the first decimal manipulation which really requires a "rule." For many years the rule most popular in schools generally was that of counting the decimal places and marking off in the product the sum of the decimal places in the multiplier and multiplicand. Thus the example 2·3 × 4·5 would be worked as ordinary multiplication (see right). The product 1035 would then be written as 10·35 since there are two decimal places in the 2·3 and 4·5 taken together.

$$\begin{array}{r} 23 \\ 45 \\ \hline 115 \\ 92 \\ \hline 1035 \end{array}$$

This time-honoured rule is easy of application and leads to very few mistakes. The truth of the result obtained may be demonstrated in simple cases by drawing on paper squared in inches and tenths. Thus the above example may be illustrated by drawing upon squared paper a rectangle 4·5 in. long and 2·3 in. wide. The area of this rectangle will readily be seen to be 10·35 square inches. The truth of the traditional rule is easily capable of being demonstrated more generally to older pupils by more academic and theoretical means, but for Juniors a simple diagram, such as that indicated above, should suffice.

In recent years there has been a tendency to adopt more obviously rational methods in the multiplication of decimals by decimals than the time-honoured method of "counting the places" which has so long been in vogue. Grammar Schools in particular have long shown a distinct partiality for what is known as the "standard" method, and more and more Primary Schools are now adopting this method.

The Standard Method

Example: ·62 × 21·4.

In the standard method the multiplier is first expressed in "standard" form, i.e. with one digit only to the left of the decimal point. Thus the multiplier 21·4 is first changed to 2·14 and a compensating change is made in the other factor, i.e. ·62 becomes 6·2.

The example is now in the form—

6·2 × 2·14

This is worked as seen on the right.

$$\begin{array}{r} 6{\cdot}2 \\ \underline{2{\cdot}14} \\ 12{\cdot}4 \\ {\cdot}62 \\ \underline{{\cdot}248} \\ 13{\cdot}268 \end{array}$$

It will be seen that the multiplication begins with the left-hand figure of the multiplier, that the decimal point remains vertically fixed, and that the partial products appear with their actual value. All these are claimed to be advantages of the standard method of multiplication, and an additional advantage is that the standard form enables a reasonable approximation to the answer to be quickly made. Thus in the above example—

$$6{\cdot}2 \times 2{\cdot}14$$

is seen at sight to be between 6·2 × 2 and 6·2 × 3, i.e. between 12·4 and 18·6.

For Junior pupils the method may be used throughout, and will be found to be as readily learnt and used by the pupils as the older traditional method, especially if the decimals used are restricted as far as possible to not more than two places. We work one more example for the benefit of the unconverted.

Example: 12·4 × ·37.

In standard form: 1·24 × 3·7

Approx. answer: Answer must lie between 3·72 and 4·96.

By calculation: 4·588.

Working

$$\begin{array}{r} 1{\cdot}24 \\ \underline{3{\cdot}7} \\ 3{\cdot}72 \\ \underline{{\cdot}868} \\ 4{\cdot}588 \end{array}$$

Division of Decimals—Division by an Integer

This process is identical with ordinary division of number, short, long, or by factors as may be necessary.

It should be noted that short division in particular is very useful for changing simple fractions into decimals. Example: "Express $\frac{3}{8}$ as a decimal."

This may be worked by simple division as follows—

$$\begin{array}{r} 8\overline{)3{\cdot}} \\ {\cdot}375 \end{array}$$

Division by 10, 100, 1,000, etc., is clearly only a matter of "moving the decimal point." Thus it follows that $\frac{1}{10}$ of 2·5 is ·25 and, similarly, that $\frac{1}{100}$ of 32 is ·32. This process is similarly very useful for converting fractions to decimals, since it is clear that if $\frac{1}{2}$ = ·5 then $\frac{1}{20}$ = ·05.

Division of Decimals by Decimals

This has always been reconized as the most difficult of the ordinary decimal "rules." The main difficulty is not so much the actual division, as that of fixing correctly in the quotient the position of the decimal point.

Many different methods have been adopted by teachers for minimizing this difficulty. The method formerly very popular in our schools was that of making the divisor a whole number. Thus the following example: 152·28 ÷ 32·4, would first be expressed in the form 1522·8 ÷ 324, and division would proceed as in ordinary division. The method is easily explainable, easily taught, and readily learned. The only disadvantage is its occasional clumsiness and the fact that the remainder at any stage, if any, is not given at its true value.

An older method formerly popular was that known as the method of Equation of Places. In this the above example would be changed from—

$$\frac{152{\cdot}28}{32{\cdot}4} \text{ to } \frac{152{\cdot}28}{32{\cdot}40} \text{ and finally to } \frac{15228}{3240}$$

the decimal point being ignored after the number of decimal places had been "equated."

This method also is simple and easy, but suffers from the same defects as those of the first method just described.

A third method is a simple reversal of the old method of multiplying decimals by adding the decimal places in the multiplier and multiplicand and marking this number in the product. In division the method operates as follows: Taking the same example discussed above, and ignoring for the moment the decimals in 152·28 ÷ 32·4, we obtain by simple division the quotient 47. Now by *subtraction* we note that since there are two decimal places in the dividend and only one place in the divisor, it follows that there must be *one* place in the quotient, which accordingly is 4·7. This method is so remarkably simple in application that it is surprising that its use is not more widespread. Its main defect is that it appears to a young pupil to be simply a trick. Of late years, particularly in the Grammar Schools, and to a lesser extent in the others, the "standard method" has gained many adherents, and would appear likely to become the general method in schools during the next generation.

The method as in multiplication consists of first expressing the divisor in "standard form," i.e. with a single digit in the units place. Worked by this method the example 152·28 ÷ 32·4 is first expressed as 15·228 ÷ 3·24, where the original divisor 32·4 now appears in "standard form," i.e. 3·24. The division then proceeds as in ordinary division. Adherents of the "standard" method claim that it removes immediately the difficulty of fixing the decimal point in the quotient, since it is clear that the answer to 15·228 ÷ 3·24 is approximately 5. The process was accordingly recommended in the following paragraph in the 1927 edition of the *Handbook of Suggestions*—

> In division of decimals a preliminary rough answer is readily obtained mentally by reducing the divisor to "standard form." Thus, 9·126 ÷ ·72 becomes, in standard form, 91·26 ÷ 7·2, and the approximate answer is obtained by dividing 91 by 7. If this method of division is used in written work, and the quotient is placed over the dividend, beginners should have little difficulty in fixing the position of the decimal point.
>
> In working concrete examples, the value of the "remainder" is sometimes required. Where the division is worked without transforming the divisor and dividend as above, the value of the remainder can be stated without much difficulty, but in cases where the divisor and dividend have been transformed, as in the "standard form" method of division, the value of the new units in the dividend must be clearly understood, if the value of the "remainder" is to be estimated.

The slight difficulty in dealing with the remainder will be seen by working the example given above—

9·126 ÷ ·72 appears in standard form as 91·26 ÷ 7·2.

The division is as set out on the right, and the remainder appears as ·54. But since the original divisor and dividend have been transformed (by multiplication by 10), it follows that the remainder has also been transformed, and that the real remainder is not ·54 but ·054.

$$\begin{array}{r} 12{\cdot}6 \\ 7{\cdot}2\overline{)91{\cdot}26(} \\ \underline{72\phantom{{\cdot}26(}} \\ 19{\cdot}2 \\ \underline{14{\cdot}4} \\ 4{\cdot}86 \\ \underline{4{\cdot}32} \\ {\cdot}54 \end{array}$$

We have discussed the difficult question of division of decimals by decimals at some length because of its importance, but it is probable that the very simple cases which will be encountered at the Junior stage will not need much acquaintance with formal rules.

The Relation Between Vulgar and Decimal Fractions

Much time was formerly spent in Junior Schools in the processes of changing vulgar fractions to decimals and decimals to vulgar fractions. Work of this kind is still necessary, but need not be over-elaborate. This point is emphasized in the 1927 *Handbook*.

> While the scholar should be able with facility to transform a decimal into a vulgar fraction and *vice versa* . . . it is important that he should be trained to think of quantities involving decimals without necessarily converting them into vulgar fractions.

We have indicated above how simple fractions may be changed into decimals by simple division, and the converse process of expressing decimals as vulgar fractions presents no difficulties. Thus the decimal ·45 may readily be expressed as $\frac{45}{100}$, which is reducible to $\frac{9}{20}$. Occasionally as in this case the labour may be reduced by the following device: $\cdot 45 = \dfrac{4\frac{1}{2}}{10} = \dfrac{9}{20}$.

Much time was formerly spent in converting fractions such as "thirds," "sixths," "sevenths," "ninths," etc., to decimals, all of which resulted in recurring decimals, but to-day, by common consent, recurring decimals and their theory, in spite of the undoubted interest of the subject, are now generally omitted from the Arithmetic syllabus in Junior Schools.

Concrete Decimals

Decimals, merely considered as decimals, will fail to interest the average Junior pupil for very long unless they are constantly applied to money and concrete quantities. These applications, as in the case of vulgar fractions, will be of two general kinds—

(*a*) Finding a given decimal fraction of a given quantity.

(*b*) Expressing one quantity as the decimal fraction of another.

Typical examples of these are as follows—

1. What is ·85 of 5 yd.?

2. Express 12 oz. as the decimal of 1 lb.

The former of these should be worked as far as possible by the method of continued multiplication as in reduction. Thus Example 1 may be worked as on the right—i.e. 4 yd. 9 in.

$$\begin{array}{r} \cdot 85 \\ 5 \\ \hline 4\cdot 25 \text{ yd.} \\ 3 \\ \hline \cdot 75 \text{ ft.} \\ 12 \\ \hline 9\cdot 00 \text{ in.} \end{array}$$

The answer could also have been obtained by a fractional method, thus—

$$\cdot 85 = \frac{85}{100} = \frac{17}{20}$$

$$\frac{17}{20} \times 5 \text{ yd.} = \frac{17}{4} \text{ yd.} = 4\frac{1}{4} \text{ yd. Ans.}$$

Example 2 may similarly be worked either by the reduction method or by the fractional method.

$$\text{e.g. Reduction: } 16\overline{)12} \atop \qquad\qquad\qquad\quad \cdot 75$$

$$\text{Fraction: } \frac{12}{16} = \frac{3}{4} = \cdot 75$$

Generally, save in very simple cases, the method of reduction is preferable to the fractional method.

Decimalization of Money

The application of decimals to English money is usually considered to be of great importance in English schools, especially in connection with decimal fractions of £1.

Thus it is customary to teach pupils to express at sight, correctly to three places at least, any sum of money as £ and decimals of £1, and similarly to evaluate in £ s. d. any sum of money expressed in decimal form.

At once let it be said that real facility in changing from one notation to the other will hardly be reached in the Junior School, but many other simpler applications are possible.

In the first place, all children should learn to decimalize shillings. Here the basis is 2s. = £$\frac{1}{10}$ = £·1. From this by multiplication we may decimalize any *even* number of shillings, and by division we may obtain 1s. = £·05, and, in consequence, we may readily decimalize any *odd* number of shillings. From this basis (as well as independently from fractions) the pupils may discover special values such as 10s. = £·5, 5s. = £·25, and 15s. = £·75. Beyond this ability to decimalize shillings rapidly it will probably be unnecessary for children to proceed at the Junior stage, though many examiners have expected scholarship candidates to reach a much higher level than this at the age of eleven, as will be seen from the examples given at the end of this chapter.

The converse process of finding the value in £ s. d. of a given decimal of £1 should be taught by the method of reduction, at the first stage. We illustrate by an example: Find the value of £·78 to the nearest farthing.

This may readily be obtained by the reduction method, by multiplying in order by 20, 12, and 4, as set out on the right. The answer is clearly 15s. 7¼d. (nearly). At a later stage the pupil will learn the usual rule for converting this decimal at sight into £ s. d.

$$\begin{array}{r} \cdot 78 \\ 20 \\ \hline 15\cdot 60 \\ 12 \\ \hline 7\cdot 2 \\ 4 \\ \hline \cdot 8 \end{array}$$

Approximate Values

The subject of approximate values of decimals may receive some attention even at the Junior stage. Thus our pupils should realize at any early stage the relative unimportance of the successive figures in the decimal places to the right, i.e., they should know that either ·71 or ·69 for all practical purposes may be taken as ·7 in most examples, and exercises may accordingly be set of the type: Express the following decimals correct to the nearest tenth or nearest hundredth.

Conclusion

We have indicated above what we consider to be possible in the teaching of decimals in our new Junior Schools. Teachers who have read diligently what we have written will appreciate our claim that pupils thus taught will grasp the facts—

(*a*) That decimals are not as terrible as they may have been thought to be.

(*b*) That they are easy to understand, simple to manipulate, and very valuable in application.

(*c*) That they can be learned independently without too much reference to corresponding vulgar fractions.

(*d*) That their use is now almost universal, and that in general they give results more accurate and more intelligible than vulgar fractions can possibly give.

It is now agreed that anything like a detailed treatment of fractions and decimals is out of place in the Junior School, but the following examples culled from examination papers, indicate what is possible with the best pupils at the age of eleven. The work must be adapted to the capacity of groups within the class.

MENTAL EXAMPLES

ANSWERS *only* TO BE WRITTEN

1. Express $\frac{3}{100}$ as a decimal.

2. Add together 7 tenths and 6 hundredths.

3. If 1 kilogram is 2·2 lb. express 10 kilograms in lb.

4. What is the difference between ·09 and ·1?

5. Write the decimal ·898 correct to the nearest tenth.

6. What is the distance round a square of side 1·5 in.?

7. What is the distance round a rectangle 3·5 in. long and 2·5 in. wide?

8. What is 100 times ·34?

9. What is one-tenth of 3·6?

10. What is the difference between $\frac{1}{2}$ and ·4?

11. Multiply 3·2 by 5.

12. What is the value of ·7 × ·7?

13. Divide 2 by ·2.

14. A line 7·5 in. long is divided into 5 parts. How long is each part?

15. How many pieces of ·6 in. are there in 7·8 in.?

16. How many shillings are there in £1·4?

17. What decimal of £1 is 12s.?

18. Give the value of ·75 of 10s.

19. Give the value of 1·23 of 8s. 4d.

20. Add together ·25 of 1 yd. and ·5 of 1 ft.

21. How many sixpences are there in ·125 of £5?

22. What decimal of 1 ton is 13 cwt.?

23. Multiply 16 by 2·5.

24. ·7 of a number is 49. What is the number?

WRITTEN EXAMPLES

1. *Arrange the following decimals in the order* of their size, placing the greatest first—

4, ·4, ·045, ·309

2. From the greatest of the following decimals take the least—

·55, ·98, ·62, ·09

3. In the decimal 39·39 find the difference in value between the two figures 9.

4. Without working in full give approximate answers to the following—

(*a*) 7·9 × 4·1
(*b*) 35·9 ÷ 7·2

5. Simplify the following and give the answer as a decimal—

$$\frac{7}{10} + \frac{27}{100} + \frac{4}{5} + \frac{1}{2}$$

6. Two parcels together weigh 20·5 lb. but *one is 2·25 lb. heavier than the other.* What is the weight of each?

7. Find the total value of £·625, 3·4 half-crowns, and 2·125 shillings.

8. If a map-scale is 50 miles to the inch, what distance in miles is represented by 3·7 in.?

9. If a map-scale is 1 in. to the mile, how many *yards* are presented by 1·3 in.?

10. Give the sum of money represented by each figure separately in £7·65.

11. By mistake a boy copied £5·175 as £5 17s. 5d. By how much was he wrong?

12. How many times can 3·6 pints be taken from 12 gallons?

13. How many post cards 5·4 in. long and 4·5 in. wide will be needed to cover an area 2 ft. 3 in. long and 1 ft. 6 in. wide?

14. If 1 pint of oil weighs 1·12 lb., how many gallons will weigh 1 cwt.?

15. How many pieces of 2·2 yd. can be cut from 10 yd., and what length is left?

16. By selling an article for £1 a man gained ·2 of its cost price. What did it cost?

17. If 1 sea-mile is equal to 1·15 ordinary miles, how many sea-miles are equal to 46 ordinary miles?

18. A man travelled ·125 of his journey by boat, ·45 by car, and the remaining 60 miles by train. What was the length of the whole journey.

19. A sum of money was paid in notes and silver. £6 10s. was paid in silver, and ·35 of the whole in notes. How much was paid in notes?

20. In a village the death rate for a year was 16·8 per 1,000. How many died out of a population of 1,750?

21. If 43 × 37 is equal to 1,591, write down answers to 4·3 × 3·7 and to ·43 × 3·7.

22. A candle 6·5 in. long burns at the rate of 1·2 in. per hour. What length is left after $4\frac{1}{2}$ hours?

23. How many meshes will there be in 1 square foot of gauze if each mesh measures ·4 in. by ·3 in.?

24. If £1 is equal to 2·80 dollars, what is the smallest number of dollars that can be exchanged for an exact number of pounds?

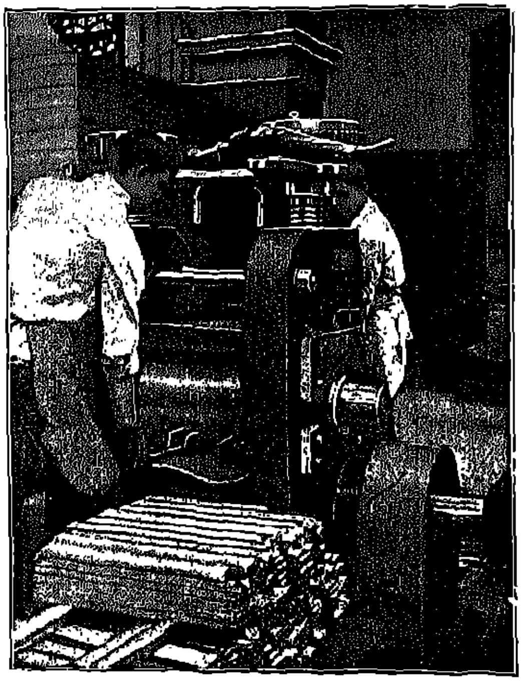


FIG. 9

Cupro-nickel Bars being Rolled to the Required Thickness at the Mint

Editorial Note. Gold and silver were long used for coins (see coins on page 307). The derivation of our own £ s. d. is interesting as showing the changes which overtake certain coins in the process of time.

£, representing *Libra*, was originally a pound weight of *silver*.

The *solidus* of the Middle Ages, from which comes our s. for shillings, was originally a Roman *gold* coin.

Our d. for pence comes from the *denier* of the Middle Ages. This name is a corruption of the Latin *denarius*, a Roman *silver* coin. The Gauls acquired it from the Romans, dropped the inflection and debased it into a copper coin, which was widely used among the trading nations of Europe in the Middle Ages.

The English word *Penny* comes from the German *pfennig*, meaning a pledge.

INDIVIDUAL WORK IN ARITHMETIC

IN the *Handbook of Suggestions* it has indeed been well said that *all* arithmetic is really mental. It might equally well be said that all arithmetic is really *individual*, since results depend in the end upon the efforts of each individual pupil put forth independently.

To accept such a statement is to accept a truism, and not to stultify in any way the remainder of this article, which would appear to imply that other kinds of arithmetic exist, for older teachers, at least, are aware that in the short space of two or three decades we have progressed a very great distance from the old four-sums-on-the-blackboard collective method of practising arithmetical exercises, to the modern individual approach by independent study through the medium of apparatus and class-books. It will be profitable to recall for a few moments these older methods of other days. Class-books were practically non-existent, even "cards" were largely a novelty; written work was mainly performed on slates, and as a result practically every arithmetic lesson took the same form—a short period of oral arithmetic followed by the working of "sums," previously written by the teacher on the blackboard. Four sums were usually considered sufficient for an exercise or test, and these by tradition consisted of three "mechanical" examples and one "problem." The whole of a large class accordingly marched conveniently at the same pace along a somewhat dull and restricted highway. At the end of the year the annual examination took exactly the same form. The only "apparatus" commonly seen in the school was a "ball-frame," used generally merely for counting in units, while "rulers," other than round rulers, if used at all, were seen only in the drawing lesson.

The reaction against these dull and uninspiring mass-methods of instruction first became evident in the Infants' Departments of our schools. Here the practical methods advocated by such pioneers as Froebel, Pestalozzi, and Montessori gradually penetrated, and, in most cases, were most intelligently interpreted and adapted to the needs of English children. Mistakes have of course been made, but out of a somewhat bewildering wealth of theory—not all suitable to English pupils—our Infant teachers have evolved a remarkable series of practical arithmetical applications, nearly all of which call for independent and individual effort on the part of the pupils. Thus, to-day, in good Infants' Schools such dull topics as "tables" are first studied by the actual handling of groups and sets of objects, and by simple activities in shopping, weighing, drawing and measuring, the pupils as far as possible *constructing* their own problems before solving them.

Space does not permit us here to describe the wealth of highly ingenious apparatus which is now available for the teaching of Number and the Simple Rules. These will be found fully described in any treatise on modern Infant methods, and may be observed in action in all modern Infants' Departments. While praising unstintingly all such methods properly applied, it is perhaps fitting that we should here examine a criticism of modern Infants' School methods in arithmetic, which is sometimes made by those teachers of Juniors who receive these pupils at the end of their Infant period. Here, we are told, while exhibiting much apparent "intelligence" in arithmetic, children from modern Infants' Schools, taught through apparatus and individual work, are frequently not only ignorant of "tables" and "rules," but do not seem to realize in any way that the fundamental necessity of all arithmetic is accuracy. While in no way subscribing to the general truth of such criticism, we feel bound to emphasize, for the sake of those who would teach arithmetic successfully, to either Infants or Juniors, that "tables" when "built up" or dissected must be *committed to memory*, and that "rules" and processes, once understood, must be diligently *practised*, so that their application becomes, as far as possible, a matter of automatic accuracy.

We shall now proceed to discuss a few of the ways in which individual work may be utilized in ~~teaching arithmetic in~~ Junior Schools.

Individual Work in Mental Arithmetic

Here clearly the old oral method of "hands up" must be discarded if the aim is to ensure that each pupil should make independent and individual effort.

For this purpose several methods are possible, all of which will require the answers to be *written down* separately by each pupil.

(*a*) The examples may be *dictated* by the teacher, and the answers written down by every pupil.

(*b*) The examples may be graphed, cyclostyled, or even prepared on the blackboard, answers again being written down.

(*c*) Printed books of examples may be used, answers in every case being written down.

Methods (*a*) and (*b*) demand considerable preparation on the part of the teacher, and much will depend upon the variety and suitability of the examples given to the pupils.

Method (*c*) makes less demands on the teacher, but much depends upon the suitability of the examples in the selected class-book [*Commonsense Mental and Intelligence Tests*, by F. F. Potter (Pitman) have been specially prepared for this purpose].

In every case it is essential that *answers only* should be written down, and that "copying" should be prevented. If these two essential factors can be secured then the teacher may be satisfied that really "individual" work is being obtained from the pupils.

Teachers who prefer to prepare their own mental examples will find many useful hints in the earlier chapter in this volume entitled Mental Arithmetic. A cardinal principle to follow is to make every set of examples follow some comprehensive plan.

Individual Work in "Rules" and Processes

Much of this work will of necessity continue to be largely collective in the Junior School, and new "rules" and new processes will conveniently be demonstrated by the teacher to all members of a group. Heuristic methods (or methods which teach by discovery) will of course be used where possible, but even these are readily adapted for class use. But the activity methods of the Infants' School may still be continued if sufficient space and apparatus are available, and this is particularly important in the earlier Junior years.

It is, however, in the *practice* of these rules that opportunities for individual work may be found. Well-graded class-books to-day contain more than sufficient work even for the brightest pupil in the class, and no limit need be placed upon the number of sums to be done in any particular set of examples. Further, in working even the dullest "mechanical" sums, interest and a healthy rivalry may be encouraged in matching pupil against pupil or group against group. In this competitive work the two essential qualities of good arithmetic—speed and accuracy—will receive ample attention. Again, either for classwork or for homework (where given) pupils may be set a definite "assignment" of work from the textbook or class-book in use. All these devices will encourage interested independent effort. Finally, pupils in the class, and even in the whole school, may, if necessary, be grouped specially for arithmetic, in order to develop ability and individuality, the point for teachers to remember being that pupils differ enormously in their ability to work sums quickly and accurately, and accordingly the method which makes all follow at the dull pace of the average or slower pupils hardly benefits even these slow pupils, and is distinctly adverse to the progress of the brighter pupil. The pace of each should be determined by his ability.

In a word, each pupil should proceed at his own pace, though, since even Juniors are occasionally lazy, it is the teacher's duty to see that this pace is the pupil's *best* pace, and not merely a pleasant easy-going jog-trot requiring a minimum of mental effort.

Individual Work in Practical Arithmetic

In the subject of Practical Arithmetic, now so popular in our Junior Schools in contrast to the duller "sums," ample opportunities occur for the development of individual work and individual effort.

We have already indicated, in the earlier articles on Money, Weights, and Measures in this volume, how these practical methods may be, and indeed must be, employed in the teaching of the units and "tables" of our English money, weights, and measures. Many of these methods are essentially individual. Indeed, we have noted that a common criticism of such a universal practical method as shopping, or playing at shops in school, is that it is difficult to find employment for all the class at the same time, but more than one shop can be set up in the classroom and groups kept busy.

The School Shop has come to stay, and time must be found so that each pupil in turn may have individual practice as buyer and also as seller, with all the consequent practice in calculating and giving change, and in weighing and measuring simple articles and commodities.

In learning the meaning of the simpler units, especially of length and weight, individual methods now are almost universal. Thus in learning the meaning and connection of such units as the inch and the foot or the ounce and the pound, the pupil, by actual individual use and handling, becomes familiar with these units as realities in a manner that the older method of learning words and tables by heart was never able to achieve. The table of length is particularly suitable for individual practical work, since every member, even of a large class, may be called on to measure different lengths and distances, and to perform calculations as to quantities and costs based upon these measurements. Teachers should prepare a list of these "*things to be done*" *in practical arithmetic*, by each child working independently. These exercises have conveniently been termed "figureless" sums, since the data, instead of being supplied by the teacher or class-book, must be first found by the pupils, before any calculations can be made.

We indicate for the guidance of teachers a few of these typical individual projects.

Individual Exercises in Practical Arithmetic

(These are given merely as types. The teacher of each Junior class should provide a similar list of assignments suitable to the age and ability of the class.)

1. Measure the greatest distance you can span with one hand. What would be the length of twelve spans?

2. Measure the length and width of the card given to you. What is the longest line you could make with twenty such cards?

3. Measure the length and width of this piece of paper (supplied) and so find its area. What area could you cover with one dozen of these pieces of paper?

4. Measure the thickness of this book (supplied), and then find the height of a pile of 5 dozen of these books.

5. Measure the length of a new lead pencil and find how long it would last if used at the rate of half an inch a week, the last inch being thrown away.

6. Measure the length of a new candle. If this were lighted at 8 p.m. and burned at the rate of half an inch an hour when would it be all burnt?

7. Find the weight of a new candle and then try to find how many of these candles would weigh one pound.

8. Find the length of a school desk, and then find the total length of all the desks in your classroom.

9. Find the length and width of this table and then find the size of the table cloth to be placed on it and to hang over one foot on each side.

10. Find the length of picture moulding and the area of the glass necessary for framing a given picture.

11. Find the length and width of your classroom, and then find the cost of putting a picture rail all round it at 6d. per foot.

12. Record, from your own measurements, your own height and weight.

13. Find your own height in metres and centimetres.

14. Find the average height of six boys (girls) in your class.

15. Find the average weight of six boys (girls) in your class.

16. Find the difference in height between the tallest and the shortest boy (girl) in your class.

17. Find the difference in weight between the heaviest and lightest boy (girl) in your class.

18. Find the postage necessary for this letter: (*a*) for Great Britain, (*b*) for a foreign country. (Consult postage tables.)

19. Find the postage necessary for this parcel: (*a*) for Great Britain, (*b*) for a foreign country. (Consult postage tables.)

20. Find the weight of a pint of water and of a pint of milk.

21. Find the length of a new shoe lace or boot lace, and then find the total length of two gross pairs of such laces.

22. Fill a small box with sand and find the weight of the sand. Then find the volume of the box, and try to find the weight of 1 cub. ft. of sand.

23. Find, by means of a piece of thread or string, the distance round a circular pipe.

24. Measure the distance across a penny and then find the length of the line you could make with £1 in pennies.

25. Find the number of halfpennies which weigh 1 oz. and so find the weight of £1 in halfpennies.

26. Find the distance across, and the distance round, an ordinary bicycle wheel.

27. Find the cost of painting one long wall of your classroom for half its height at 1s. per square foot.

28. Measure in tenths of an inch the length and width of an English postage stamp, and then find the area you could cover with 100 stamps.

29. Find the area of the square you could make by bending this length of wire (given).

30. Find the height of the equilateral triangle you could make by bending this length of wire (given).

31. Find the area you could cover with twenty set-squares the same size as the one you use.

32. If you only had a 5-pt. jug and a 3-pt. jug, how could you measure out 1 qt. of liquid?

33. What weights would you choose from the following in order to weigh 10 lb.? 1 lb., 2 lb., 4 lb., 7 lb.

34. Using an ordnance map, find the distance (*a*) as the crow flies, (*b*) by main road, from your town (village) to ——.

35. Consult a time-table and find the best train in the day from your town to London (or any other convenient large town).

36. Make a list of the clothes you are wearing and estimate their total cost.

The above will indicate to teachers who are interested exactly what is possible in this subject of practical arithmetic. The list of topics selected for the class should be displayed prominently in the classroom, and pupils should be encouraged to use up odd spare minutes in working individually at one of these projects.

Closely akin to this purely individual work is similar work performed by small groups. Thus while one pupil can readily find the length of a *small* object, a group of two or three pupils is much more convenient for measuring longer distances such as the length of the playground. Accordingly group exercises of the kind indicated above may also be set and will prove just as valuable to the pupils as purely individual work.

These group exercises lead us directly to the subject of "projects" or centres of interest for work of all kinds, to which considerable attention is devoted in the Report of the Consultative Committee of the Board of Education on *The Primary School*. In this it is stated, among the "recommendations" (p. 139, No. 30)—

> We are of opinion that the curriculum of the primary school is to be thought of in terms of activity and experience, rather than of knowledge to be acquired and facts to be stored.

And again (p. 140, No. 34)—

> The traditional practice of dividing the matter of primary instruction into separate "subjects," taught in distinct lessons, should be reconsidered. The treatment of a series of central topics which have relations with many subjects may be a useful alternative.

This "project" method, whether pursued by individual pupils or by groups of pupils, deserves a little closer examination. The Report just mentioned elucidates the meaning for us (p. 102)—

> In its simplest form such a method . . . implies merely that the teaching, instead of consisting in imparting knowledge of a subject in logical order, takes the form of raising a succession of problems interesting to the pupils and leading them to reach, in the solution of these problems, the knowledge or principles which the teacher wishes them to learn. It is the method which an inquisitive boy is driven to follow when he wants to find out how a steam-engine or an electric bell works. It is the method which a boy scout would

follow in trying to understand how, by triangular measurements made on one bank of a river, he can calculate the distance across it. In all such instances the inquirer sets out ignorant of the scientific or mathematical principles, but keen to solve a problem that appeals to him; and the satisfaction of his desire is made to depend upon his discovering and learning the principles involved.

The whole discussion of this method of "projects," of its advantages and its limitations, is admirably set out in the *Report* and should be read by all teachers, but our immediate object here is not to discuss the project method but to indicate a few simple topics which may be used as the basis of projects to be pursued because of their own intrinsic attraction. It should, of course, be remembered that while these projects may be pursued independently as individual work, most of them gain considerably in attractiveness if undertaken by small groups of pupils as part of a wider activity discussed and planned with the class.

Some Simple Projects in Arithmetic and Elementary Mathematics

1. Consult a furniture catalogue and select furniture for an ordinary sitting-room, making a list and finding the total cost.
2. Measure and calculate the amount and cost of the curtains required for a given room.
3. Suggest a simple meal for five persons (breakfast, midday meal, tea or supper). Make a list of the materials and quantities required and estimate the total cost.
4. Measure and calculate the amount and cost of stair-carpet required for a given flight of stairs.
5. Plan a list of suitable summer or winter clothing for yourself, the cost not to exceed £5.
6. Plan a list of Christmas presents that you would like to buy for your family (or friends) at a total cost of not more than £1.
7. Find by any simple method the distance across a stream, without actually crossing the stream.
8. Find by any simple method the height of a tower or church steeple.
9. Plan a picnic to last a whole day for twenty people. Make a programme for the day and estimate the total cost per person.
10. Try to take a traffic census on a busy main road, by counting and grouping the different types of vehicles that pass in a given time.

Many of these, and similar projects, will occupy the pupil for more than one ordinary lesson, but this is exactly the point in which the project-method differs from the ordinary subject-treatment, where each subject occupies a definite period or periods on the time-table. With the younger pupils in the Junior School the projects will, of course, be of a very simple nature, but the essence of the method is that the teacher teaches, not by ordinary direct (and dull) methods, but by starting eager pupils upon some entertaining quest.

But, whatever the topic or method employed, there is one particular aspect of the work which must always be individual, an aspect, too, which is all too frequently avoided by children (and adults) as dull and tedious—this aspect is that of *checking* every measurement or calculation made, and every answer obtained. This habit, however uninteresting it may appear, is absolutely essential to real mathematical progress. Thus whatever the "sum," exercise, topic, or project, the pupil's work should show clear evidence of suitable checks having been applied at each step. The pupil should be taught to realize the importance of this attitude toward his work, and to learn that calculations, however accurate in themselves, are useless if based upon inaccurate data, and conversely, that all the labour of amassing accurate data is wasted if these data are inaccurately used in subsequent calculations.

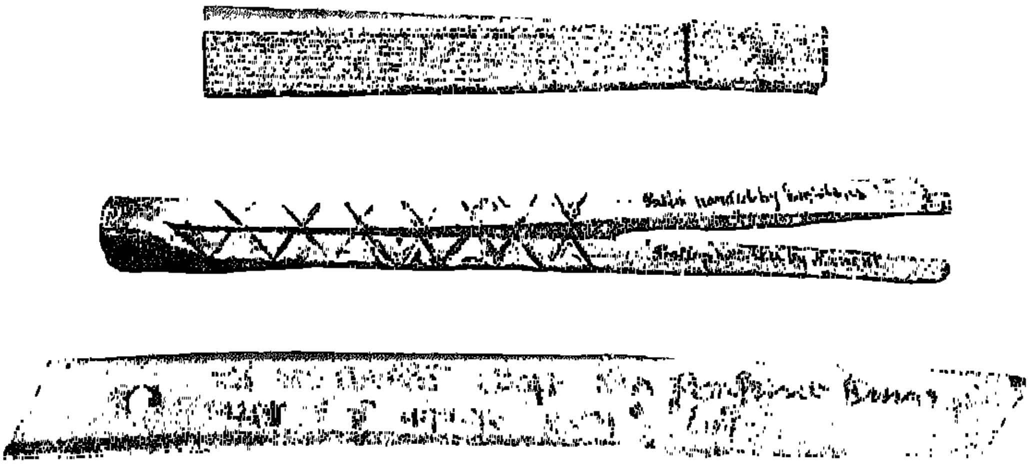
These "checks" should be applied by the pupil both before and after an example is worked. As a preliminary, a rough approximation to the answer should be made whenever possible. This practice will prevent many stupid answers from being carelessly presented as correct. Again at the end, when the example or calculation is concluded, the work should be carefully checked, the calculation being worked by an alternative method where possible. Children soon realize the advantage of such simple alternative checks as that a subtraction sum can be checked by addition, or a division sum by multiplication.

So far we have confined our remarks to the ordinary topics and syllabuses now followed in our Junior Schools, with special reference to Rules, Processes, Practical Arithmetic, and miscellaneous topics and projects. We have indicated how in our opinion the work may be individualized, and how the old collective methods may be varied by newer methods and devices.

All these devices aim at maintaining in each child a steady forward movement in arithmetical attainments, since it is now recognized that pupils differ enormously in their rate of progress in this subject. Thus it is essential that provision should be made for each pupil to progress at his own pace, and the work of the teacher accordingly has radically changed in this subject. While it is still necessary for Junior teachers to give occasional collective lessons in Arithmetic, their chief work, to-day, is to provide a sufficiency of suitable examples, topics and projects—more than enough indeed for the brightest members of their class—and to see that the pupils, through real interest and joy of achievement rather than from the fear of the teacher, have constant employment and make steady progress.

It must, however, be fully realized, especially by young teachers, that individual methods make much greater demands upon teachers than the old collective methods common a generation ago. Much more work is required, both in preparation and in supervision and working, for, where each pupil proceeds at his own best pace, it follows that each pupil must receive individual supervision.

Yet, in the end, individual work, in arithmetic, as in any other subject, will bring its own reward in the increased alertness, enthusiasm and initiative of our pupils.



By courtesy of *The British Museum*

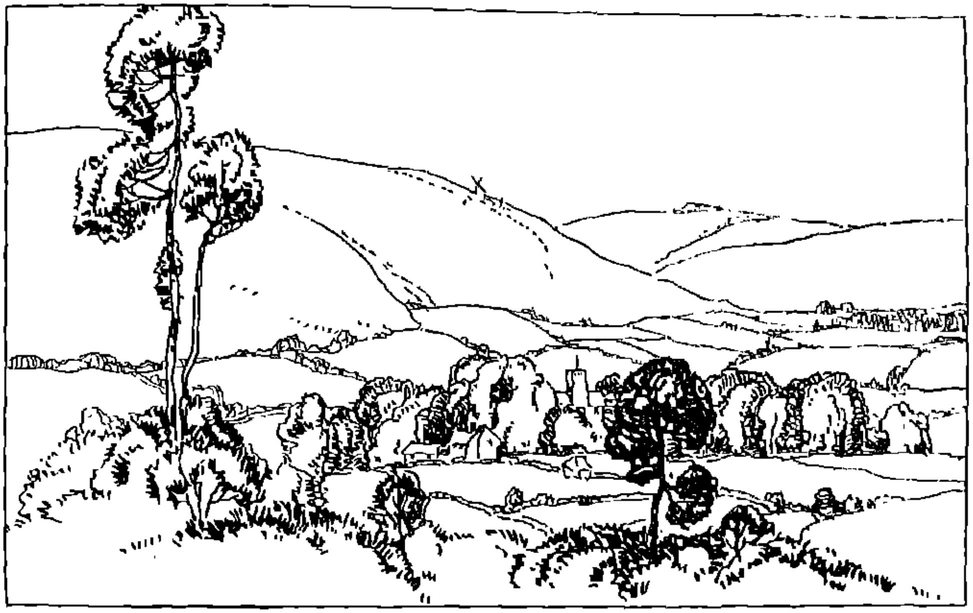
FIG. 10

Tally Sticks

Modern tally as used in Worcestershire.
Centre tally: Tally used between employer and servant.
Bottom tally. Tally of William West of Fousmere (Foulmire) in the 22nd (?32nd) year of King Edward after the conquest, relating to malt.

Tally sticks were for many years the only method of keeping accounts: notches to represent goods or amounts were made on the two edges of a stick, which was then split into two, the two halves being kept by the respective parties to the contract. When a contract was completed the two halves were often put together and retained by the appropriate party.

GEOGRAPHY



HOME AND PHYSICAL GEOGRAPHY

"Every time that he goes to school and comes home (the child) is learning place and movement. This activity and experience is indeed the germ from which the understanding of geography should develop. Whether in town or country, local geography is fundamental."—Report on the Primary School

EXPERIENCED teachers of geography are generally agreed that a well-planned school course in geography for Junior Schools should include simple lessons in regional and world geography—a first survey—together with an attempt to impart, in broad outline, some knowledge of the British Isles.

One of the most attractive methods of introducing children to geography is by means of stories of peoples of other lands, emphasizing by comparison and contrast man's three primitive needs—food, clothing, and shelter.

These stories will often arise also in connection with a project, or "activity," such as one centred on the home or our breakfast table.

It is the present purpose, under the heading of Home Geography, to discuss the need for the study of seasonal and local geography simultaneously with regional and world geography, omitting dry-as-dust definitions.

It is suggested that the best way to teach this so-called "Home" geography is to arouse the interest of the children, by means of informal conversations, in seasonal observations, the connection between wind and weather, the neighbourhood in which the children live, and in map-making, leading up to a simple survey of the locality.

1. *The Study of Maps*

This forms a very important part of the geography course. Map reading and the intelligent use of the atlas cannot effectively be taught by incidental reference. Neither can children "pick it up" as they proceed through the school. A carefully-planned school course should include provision for definite instruction in this subject, which can be made interesting and stimulating by the enthusiastic teacher. The suggestions given in the following pages are not intended to be taken as indicating the ground to be covered in any one year. Map making and map reading should be spread over the three or four years of the Junior Course, and should lead up to the study of the 6-inch Ordnance Survey Map of the local district, copies of which may be obtained from the Director-General, Ordnance Survey, Southampton. Before ordering ordnance maps, teachers will be well advised to obtain *A Description of the Ordnance Survey Large Scale Maps* from the same source. This contains specimen sheets and gives a key to the various markings.

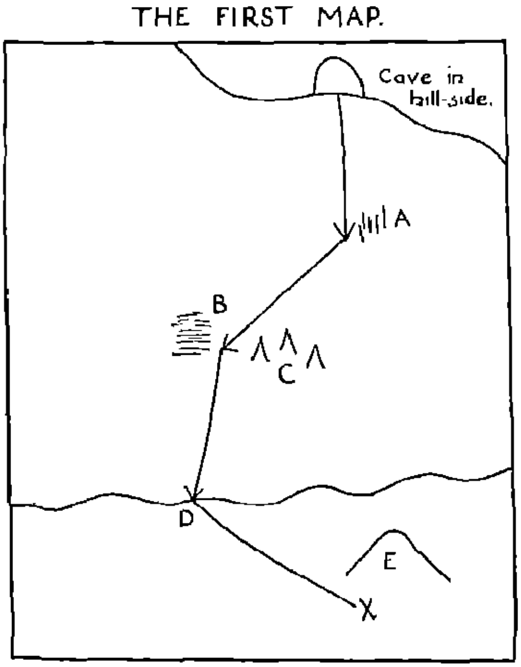


FIG. 1
The First Map

Map Making

The traditional method of introducing the study of maps by teaching how to draw plans first is not necessarily the best. Most children are more interested in simple map making than they are in a plan of the school.

The drawing of the latter may well become part of the drawing lesson, though the understanding of a plan may have its place, in due course, in the geography scheme.

Let us begin, then, by introducing map making. Many of the children have an elementary knowledge of a map already. The teacher's work is to sum up this knowledge before breaking new ground.

The First Map

Children are always interested in the beginnings of things. Just as in their history lessons they delight in stories of first things—the first use of fire, the first raft, or the first use of wheels—so they will enjoy an informal discussion on how the first map may have been made.

They may be told a story of a cave man who has killed a wild animal, but is himself injured in the struggle and has just managed to crawl back to the cave. He wishes to direct his friends to the spot where the dead beast lies.

The children can imagine him drawing on the walls or floor of the cave such a map as is shown in Fig. 1.

The marks at *A* would indicate a clump of trees, at *B* marshy land, at *C* a former encampment, *D* would be a ford over a stream, and *E* a hill. The children will be ready to fill in all the details. They will recognize that such directions as, "Take the first turning on the right, pass over the bridge, keep straight on till you come to the Library," and so on, would have been of no use in those far-off days.

The First Picture Letter

At this stage the children will be interested to hear Kipling's story of "The First Letter," from *Just-So Stories*. This is the story of a map-picture drawn by the primitive little girl, Taffy, the "Small-person-without-any-manners-who-ought-to-be-spanked," who wished the Stranger-man to fetch her father's black-handled spear from the cave. The tale of how the picture-map scratched with a shark's tooth on a piece of birch-bark was misunderstood by the Tribe of Tegumai, and the sequel to the story will fascinate the children and remind them of their first efforts at writing and drawing.

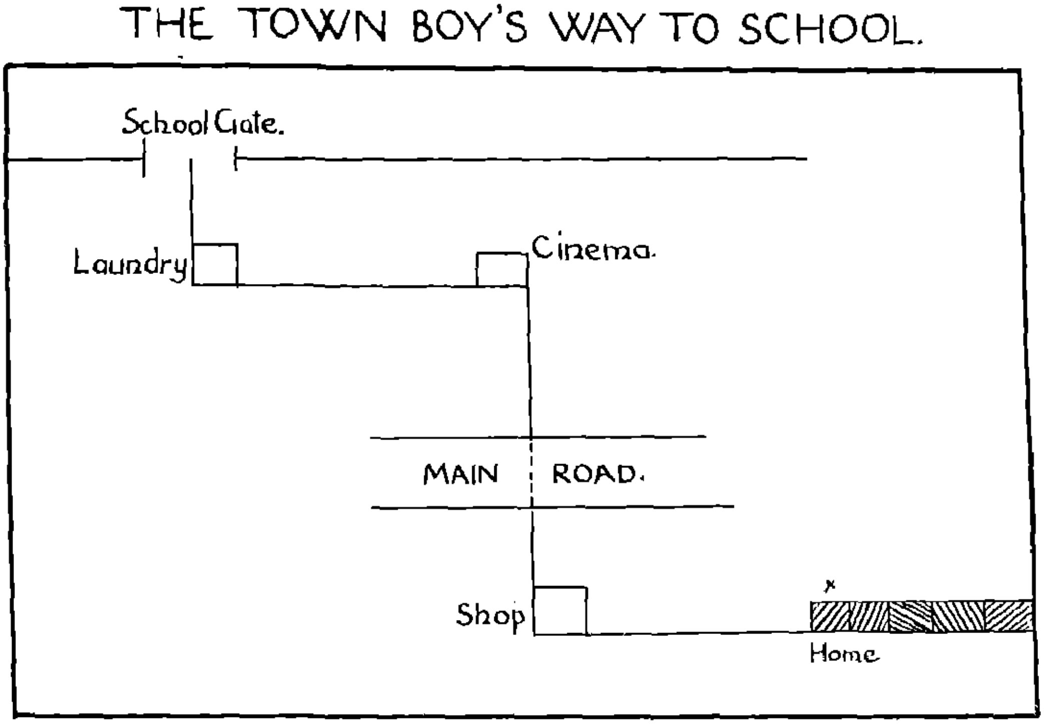


FIG. 2

Single-line Maps: The Way to School

Now let them draw a map showing the way to or from school. Their first map will be simply a single-line drawing showing changes of direction. A town child's effort may take the form of that shown in Fig. 2.

The country child's map showing the way to school may not be so simple as that drawn by the town child. He may draw such a map as is shown in Fig. 3.

The following are further suggestions for simple line maps.

1. A local bus or motor-coach route.
2. The way to the railway station.
3. The way to the cricket field.
4. A "shopping" map.
5. Maps illustrating: the story of *The Three Bears*; Red Riding Hood's walk through the Wood; *The Forty Thieves* and the way to the treasure cave.

Map of the Classroom

The map of the classroom may now be introduced, though the finished production may be left to the drawing lesson. The children will be interested to mark the position of their desks or tables. "My place" is all-important (see Fig. 4).

They may also point out the position of the teacher's desk, the cupboards, the door, the window through which the sun shines in the morning, the window through which the sun shines during the afternoon, and the number of paces taken to step out the length and breadth of the classroom.

Map of the School

A study of a map of the school will logically follow. Most schools possess a detailed plan of this description, and frequently a plan of school and playground is also available. The children will be interested in finding their room, the way to the practical work room, and other routes that they traverse daily. They will compare the size of the hall with that of their classroom. They will be puzzled at first to find that the school is apparently smaller in the second map, which includes the playground, though the shape is the same. They will now begin to realize that less detail can be shown when a larger area is "mapped" on a sheet of set size.

A fuller discussion of the subject of scale may be left till the second or third-year course, when teachers may choose to deal with it in the Practical Arithmetic lessons.

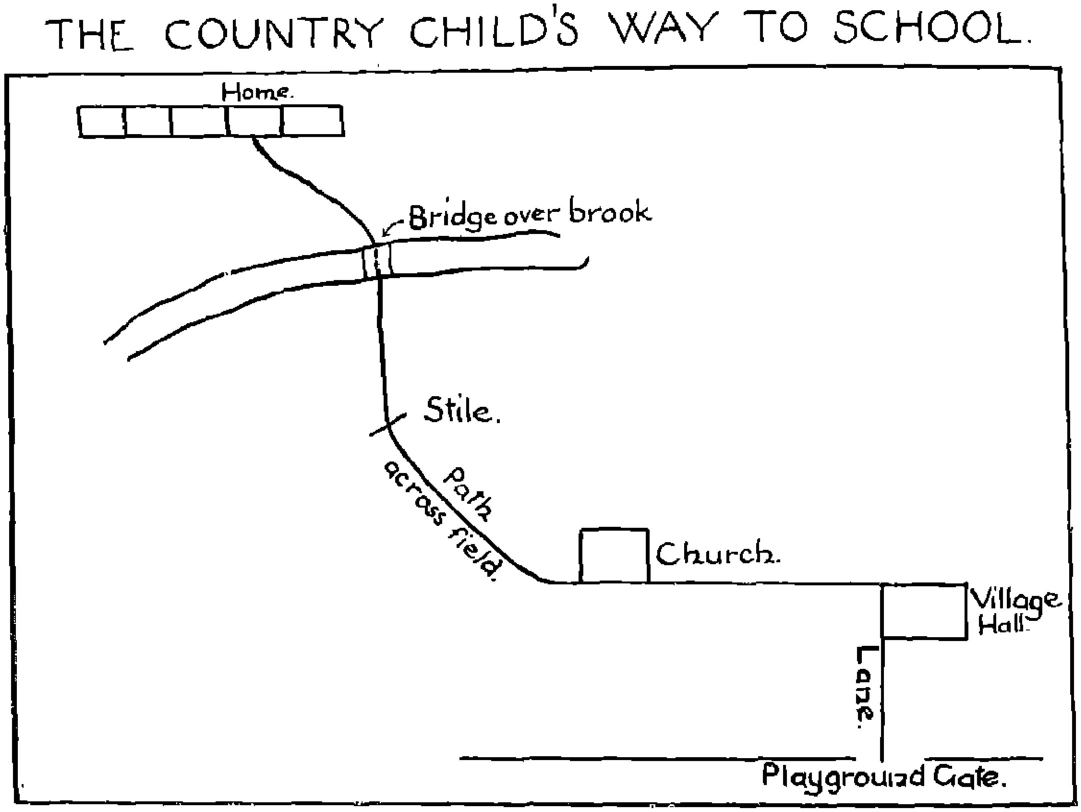

THE COUNTRY CHILD'S WAY TO SCHOOL.

FIG. 3

2. *Direction*

The first-year children have already gained some sense of direction. The town child has heard the stranger directed to the Library: "Take the second turning on the right past the Cinema," etc. In the town direction is a comparatively easy matter. The changes in route are generally right-angle turnings. In the country, though mapping out a route is not so geometrically simple as in the town, yet the child has landmarks in the church, the inn, a windmill, or a stile.

The Sun and the Pole Star

The children will probably have had stories read to them recounting how travellers found their way across deserts or great tracts of open country in olden days.

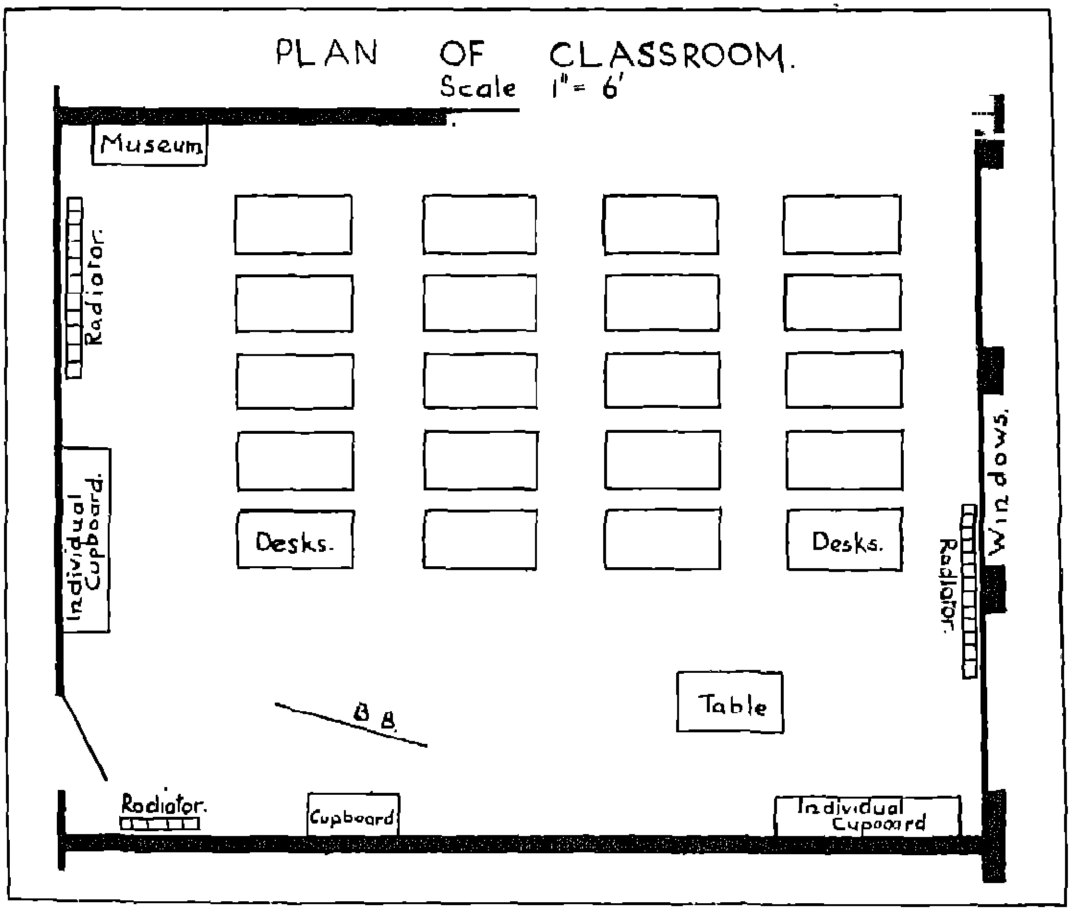


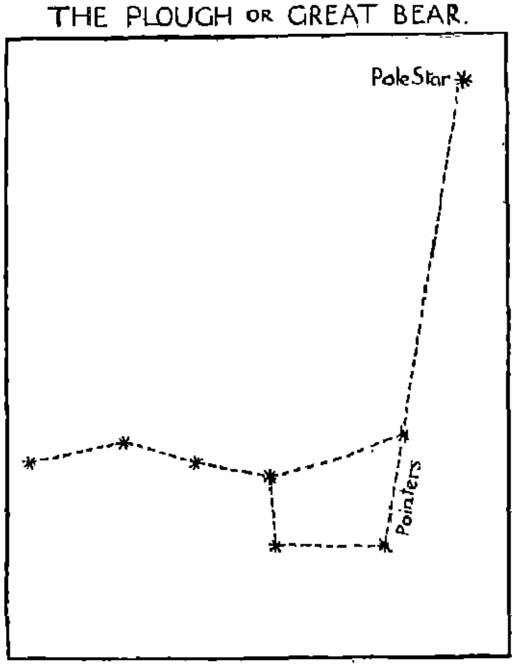
Fig. 4

During the day the position of the sun in the sky acted as a guide, for the observers knew the rising and setting directions—east and west—and the intermediate points. This subject is full of difficulties to the young child and should be but lightly touched upon.

At night the sailor or traveller looked for the Pole Star in order to find his direction. (Why not the Moon?) Here, again, we must content ourselves with a brief survey. The teacher has probably experienced the practical difficulty of attempting to find direction by means of the Pole Star, and will be wise not to take the children out of their depth. He will also bear in mind the limitations imposed by the timetable.

Though the children may be too young to make periodic observations of the Plough, they will be interested to learn the pivotal nature of the position of the Pole Star in the heavens;

they will see the resemblance to a plough, and they will note that if the group is regarded as forming a chair, a line joining the feet of the chair will point to the Pole Star.



THE CHILDREN WILL NOTE THE RESEMBLANCE TO A CHAIR. A LINE JOINING THE FEET OF THE CHAIR WILL POINT TO THE POLE STAR.

FIG. 5

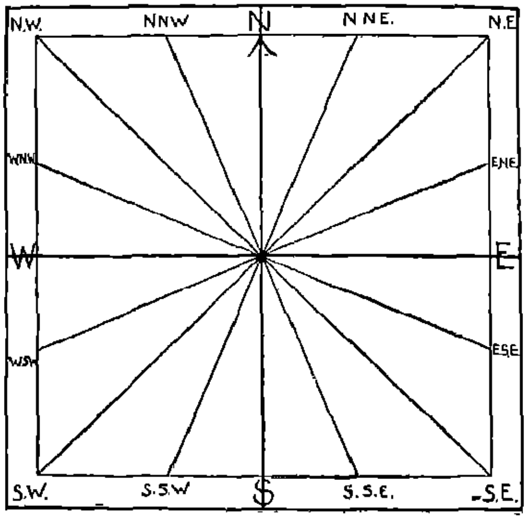
The Compass

The children will readily understand how the sailor finds his way into port, for he has his landmarks during the day and harbour lights and lighthouses at night. But what if he is out of sight of land?

The value of the compass may now be shown. The children are too young to understand magnetic details, neither need they be mystified with the difference between magnetic north and geographical, or true, north, i.e. sun north. The plain fact that the magnetized needle, when suspended, always points in the same direction is sufficient at this juncture.

The children will be delighted if they are allowed to float magnetized needles in bowls of water. They may then examine the school compass and note how the card and needle swing. They will be interested to learn that this principle was discovered by the Chinese in olden days.

A few simple exercises will familiarize them with the points north, south, east, and west, and they will readily learn that, when they face north, the south is at their back, the east on their right, and the west on their left.



COMPASS CARD.

FIG. 6

At noon, they may face the sun and locate the various points.

Exercises in Cardinal Points

1. A group of children are sent outside the room, the remainder being scattered about the floor. On re-entering they are told to find the boy four paces to the north of John then five paces to the west.
2. Which is the north wall or corner?
3. Point out the direction of the nearest seaside place, the nearest market town, the railway station, the main road.

4. Children may be asked to point to the direction of France, Scotland, Wales, the great ocean, and America.

The points NE., NW., SE., and SW. may now be introduced and each child may construct a simple compass card. A portion of a cardboard box, about 6 in. square, is all that is necessary. The *lines of direction* are more easily drawn on this than on a circular card.

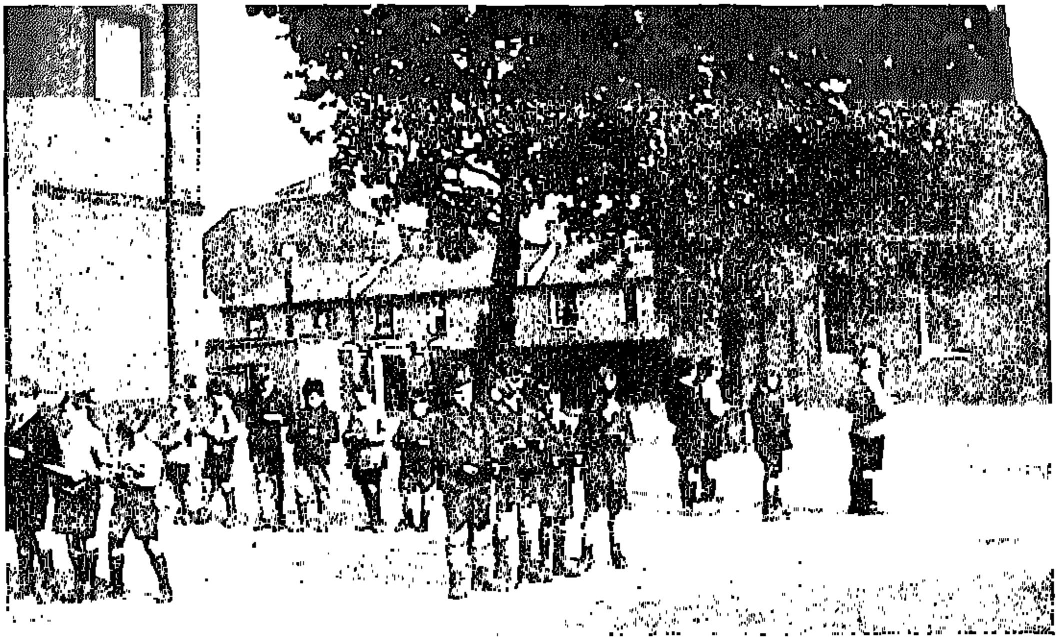


FIG. 7

Taking Bearings from Different Stations

Bearings

1. The first exercise in orientation may be given in the playground. Let every child take an active part in the work. The children may be divided into groups, each group taking the bearings of goal post, fountain, gate, etc., from different stations, the north in each case being given from the teacher's compass.

The children will soon understand the necessity of pointing their cards to the north before taking bearings, which may be checked by comparing the results at the end of the lesson.

2. If the surrounding neighbourhood is visible from the upper windows of the school, the bearings of outstanding features in the locality may be taken. The children may again work in groups and results may be compared at the end of the lesson. They will note that, if the places observed are some distance from the school, a fairly accurate result will be obtained even though the bearings are taken from different windows. The compass card bearings may be checked by means of the school compass.

An example worked by Junior children is shown on page 364.

The children will see from observation of the compass that there are other points to be taken into account. Their sixteen points give only approximate results. This will need further study in later years when more difficult exercises in boxing the compass may be attempted.

EXERCISE IN TAKING BEARINGS

Place	Bearings
Biscuit Works	E.
St. Paul's Cathedral	ENE.
South Kensington Museum	NE.
Hurlingham Tower	SW.
Crystal Palace	ESE.
Chelsea Football Ground	NNE.
Battersea Bridge	ENE.
Putney Bridge	W.
Big Ben	ENE.
Southall Gas Holder	WNW.

3. *Large-Scale Ordnance Map*

Geography teachers have, in the past, deferred consideration of the Ordnance Survey Maps till the Secondary School stage is reached. Many good reasons, however, may be adduced for introducing the large-scale map early in the school course—

1. It follows logically after the single-line maps, made by the children, showing "The Way to School."
2. It arouses practical interest in geography at the earliest possible stage.
3. It teaches the child to ask "Why?" in local geographical matters and sometimes enables the thoughtful pupil to answer his own query.
4. It requires no laboured explanation. The pupil can get on with his geographical work straightway.

Introduction to Maps—the 25-in. Map

The children's first introduction to maps should be by means of the large-scale Ordnance Survey map of the school district. The best map for this purpose is the 25 in. to the mile Ordnance map, particulars of which may be obtained from the Director-General, Ordnance Survey, Southampton, or from Messrs. Edward Stanford, Ltd., 12–14 Long Acre, London, W.C.2.

Each sheet (on this scale) covers an area of 1½ sq. miles. This map shows clearly every house in the district, railways and tram routes are clearly marked, and, in the country, the farms and fields, with their areas, are easily noted.

The School and the Neighbourhood

The interest of the children will first be centred in the school. They will compare its shape with that shown in the large plan hanging in the school hall. They will see that the shed in the playground is marked and that the various gates are shown. They will be particularly interested in tracing their way homeward and in pointing out their own homes. They may then be asked to pick out the prominent features marked on the map—the Library, the Vicarage, the Village Hall, churches, etc. They will note the tramways and railways, and will be keen to trace the course of a river.

The ordinary school 12-in. rule roughly equals ½-mile on the map, and an interesting exercise is to make a list of places which are ½-mile, ¾-mile, and 1 mile distant from the school.

Measurements

The brighter children, at this stage, may be shown how to measure along roads by means of a piece of thread or string, and to compare distances thus found with measurements "as the crow flies."

If the class is divided into teams or houses, an inter-team competition may be arranged.

In their leisure moments, the leaders may prepare queries for their opponents, satisfactory answers gaining marks for the respective teams: e.g. "Trace the quickest route from the school to the station"; "How far is it from the school to the park—(*a*) by road, (*b*) as the crow flies?" "Name the longest road shown on the map."

Some of the children may be asked to make rough tracings of the main roads in the neighbourhood of the school, and to compare these tracings with their first attempts at single-line maps showing their way to school.

While performing these exercises, the children will gradually become acquainted with many of the conventional symbols used in the large-scale maps.

Note. With regard to direction, a correct idea will be formed if maps to be studied by the children are placed horizontally on the floor, or the table, in their correct position as regards the north.

4. *Maps and Atlases*

In their geography lessons on the typical regions of the world—their peoples and products—the children have gained, during their first year, some simple knowledge of the map of the world and of the globe. They have, up to the present, been dealing with outlines and areas as far as their first survey of the world is concerned. They have seen the map of the world in two hemispheres and have compared it with Mercator's projection.

An informal discussion on the romance of map making, and on the difficulty of reproducing portions of the curved surface of the globe on the flat will, to some extent, allay their curiosity with regard to the distortion of shape and size of large areas when they compare maps with the globe. Map projection is outside the province of the Junior School.

Relief Maps

They may now be shown how to read a map of a county or of a country. For this purpose, a relief map should be used.

If procurable, a photo-relief map may be shown first. These maps appeal to young children. Then the more exact map may follow. The question of scale will again arise and the children will recognize, as the result of their previous examination of the large-scale map of the locality of the school, that the greater the area shown on the map, the less the detail that may be marked.

They will be interested in noting the varying heights of land and the depths of the sea as indicated by different colours or shades of colour. It will not be too difficult for them to measure the distance between certain towns.

Each child may keep a notebook, in which maps may be printed by means of the "Mapograph," or other excellent quick-printing aids now readily obtainable. On these maps they may mark the salient features of each lesson.

They may form an idea of distance by drawing circles, having their town as centre, showing towns within 50 or 100 miles of their homes.

To test their knowledge of varying heights they may, at this juncture, be sufficiently advanced to be asked to mark on a map of England or of the British Isles the areas which would still be visible were the country to be submerged, say, 600 ft.

They will begin to note the conditions governing the railway routes and the direction of rivers, and they may compare the areas of various river basins. In other words, they will begin to visualize important and highly interesting geographical facts. The questions of latitude and longitude may be left till later on in their school life.

Use of the Globe

The wise teacher will always use the globe side by side with the map. The globe reminds the pupil of world position. It is the real thing. It is essentially valuable when the children are studying the routes taken by famous explorers and the chief modern steamship routes, and when they are tracing out the more important airways and the recent world-famous achievements by airplane and airliner. Perhaps at this stage, the teacher will find a suitable occasion to "sum up" the knowledge of the Equator and the zones which the children have gained during their previous lessons.

They will have been shown the hot lands, the temperate lands, and the frozen lands on the globe and on the map, and they will have noticed the symmetrical arrangement of these lands on each side of the Equator.

They may now examine more closely the relative positions and sizes of the continents and oceans. They will remember these more readily if they are told some interesting facts about them.

If possible, let them find the names for themselves and discuss the time taken to cross the Atlantic and the Pacific by steamer, and North America by rail and airplane.

The North Pole is always fascinating. Let the children examine the northern hemisphere and compare it with the southern hemisphere as regards land mass and ocean.

Then let them compare the Old World and the New World in the same way.

5. *Contours*

The meaning and use of contour lines may be made a very interesting subject. Most teachers will prefer to introduce it when the children are being shown the 6 in. Ordnance Survey Map for the first time—probably to the third-year children averaging 10 years of age.

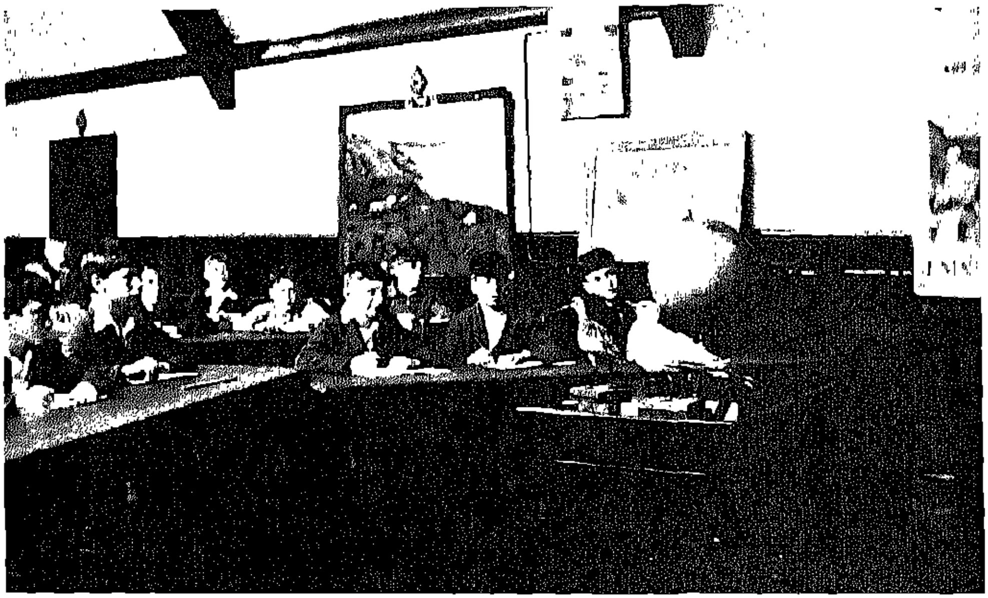


FIG. 8

The Geography Room : A Lesson on the Migration of Birds

The experienced teacher will remember that an ounce of practical experience with a model, however crudely fashioned, is worth a ton of mere "wordy" explanation. On the other hand, once the children have grasped the idea of layers and contours, the models may be dispensed with. They are but a means to an end, and, for this reason, the home-made, crude model is better than the elaborate, highly-detailed variety.

A Contour Model

On the survey map, the children will have noticed thin lines which at first they may have mistaken for rivers or roads. A brief explanation of the lines and their accompanying numbers may now be given.

Perhaps the simplest way to illustrate the meaning of contour lines is by means of a model of a hill made from plasticine.

This should be placed in a tank—the school aquarium or a tin from the science cupboard will serve admirably. Now pour in water to the depth of 1 in., and draw a line with a needle or knife point round the hill at the level of the water. Then increase the depth of water to 2 in., 3 in., and 4 in., and scratch lines round the hill at each level.

Now pour off the water and let the children examine the marks. A pencil line drawn round the model as it stands on a sheet of paper will give the base of the hill. The term "above sea-level" may be mentioned here, but no attempt need be made at this stage to explain its meaning fully.

Then, with a fine wire such as a grocer uses to cut cheese, the hill may be sliced horizontally

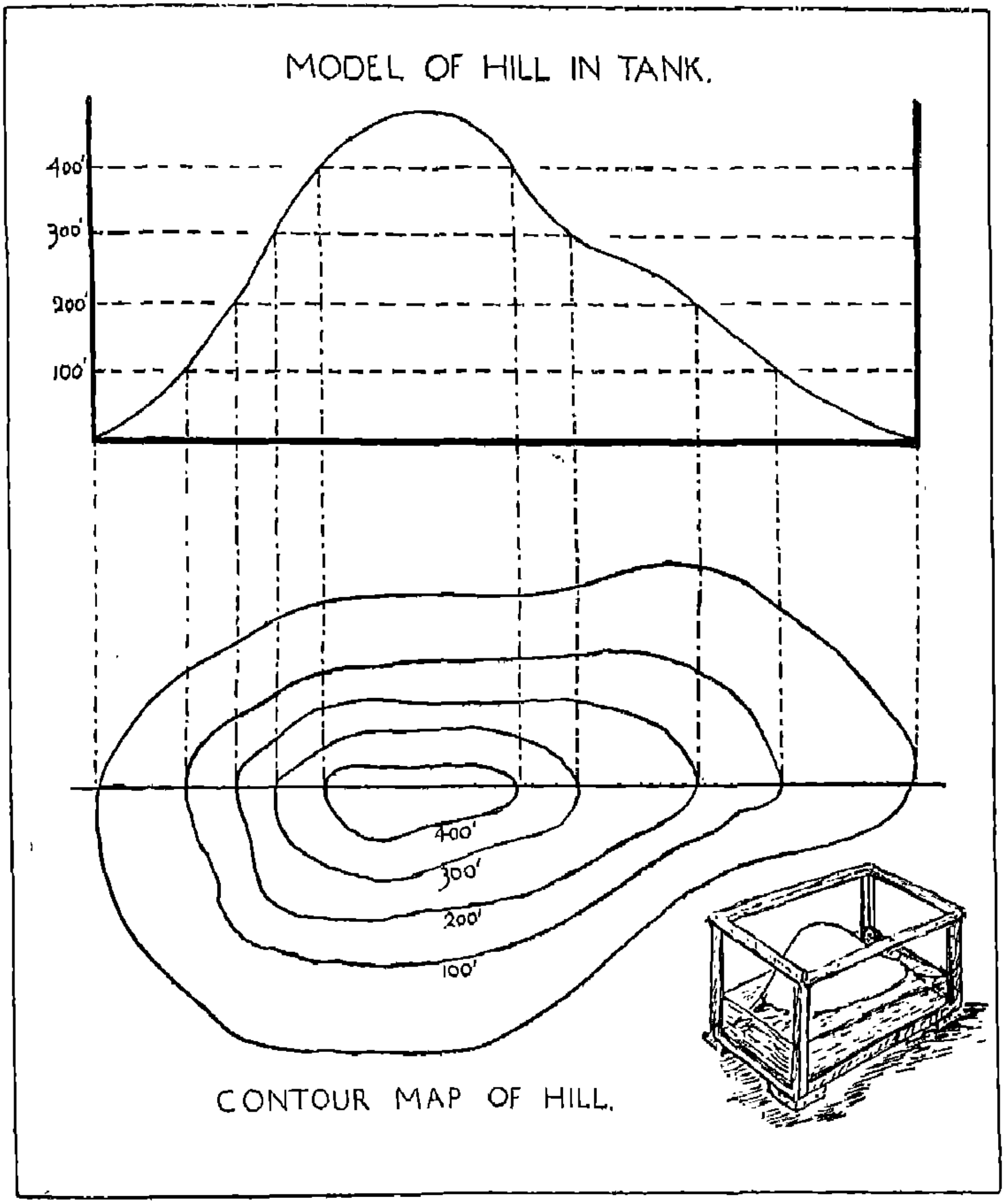


FIG. 9
Contour Map from Model of Hill

through the markings and each horizontal section traced in its correct position inside the line showing the base of the hill.

Fig. 9 shows a contour map drawn from horizontal sections.

The children will easily see that on this map the contour lines join all places of equal height, and that, on their model, 1 in. in height stands for 100 ft. They will also notice that the steeper the slope, the closer together are the contour lines.

Contour Exercises

1. An exercise which children really enjoy may be performed with the halves of big potatoes. Let each pupil invent his own vertical scale, slice the potato horizontally along the "level" lines and draw his own contour map.

2. Without unduly labouring the question, the teacher may lead the children to realize that contour maps represent the patient toil, spread over many years, of hundreds of map makers. These observers use delicate instruments in calculating the height above sea-level of various places. The following simple exercise will give the pupils some idea of how a contour map is made.

Let them copy diagram 1 in Fig. 10. This shows the height, in feet, of various places. They may then be asked to draw lines joining all places of equal height. Diagram 2 in Fig. 10 illustrates the method.

6. *The 6-in. Ordnance Survey Map*

Quite early in their Junior School career, the children were introduced to the 25-in. Ordnance Survey Map. When they have studied contours, possibly in their third or fourth year, they may be shown how to use the 6-in. Ordnance Survey Sheet of the locality. Copies for individual use may be obtained quite cheaply from the Director-General, Ordnance Survey, Southampton.

At this stage, they will have gained some knowledge of scales in their Practical Arithmetic lessons. Let them now compare the 6-in. sheet with the 25-inch map. They will note that there is less detail; the buildings and fields appear smaller in the 6-inch sheet, but a greater area is covered.

As with the 25-inch map, the interest of the pupils will first centre round the school and their homes. They will see that the position of the school is still easily found, but that it appears to be considerably smaller. [Why?]

Measurements

Let them repeat the exercises they performed with the 25-inch map. They may now, with greater accuracy, measure the distances between the school and prominent places: (*a*) by means of a piece of string laid along the winding roads or paths; (*b*) as the crow flies.

They will gain a further idea of distance if they measure the length and breadth of the land shown on the sheet and compare the area roughly with that shown on the 25-inch map.

The teacher will find that the best way to help the children to become familiar with the map is to take them on imaginary journeys. Let them find the way to the station, the nearest playing-field, or the river. They will soon be conversant with the more important symbols used, of which they should make a list. Country children will note whether the imaginary journey they are taking is uphill, downhill, or on the level, by reading the contours.

Contours with 6-in. Map

Let the children imagine they are following one of the contour lines. They will realize that if they walked along in this direction they would be keeping at the same height above sea-level.

Now, let them trace a journey crossing the contours. They will soon be able to say whether they would be walking on hilly or level ground, which way the slopes incline, and whether the ascent or descent is steep or gradual. A glance at the contour map made from the model in the tank will help in this direction.

They will also notice that the river keeps generally level with the nearest contour line. [Why?]

At this stage the children will be interested

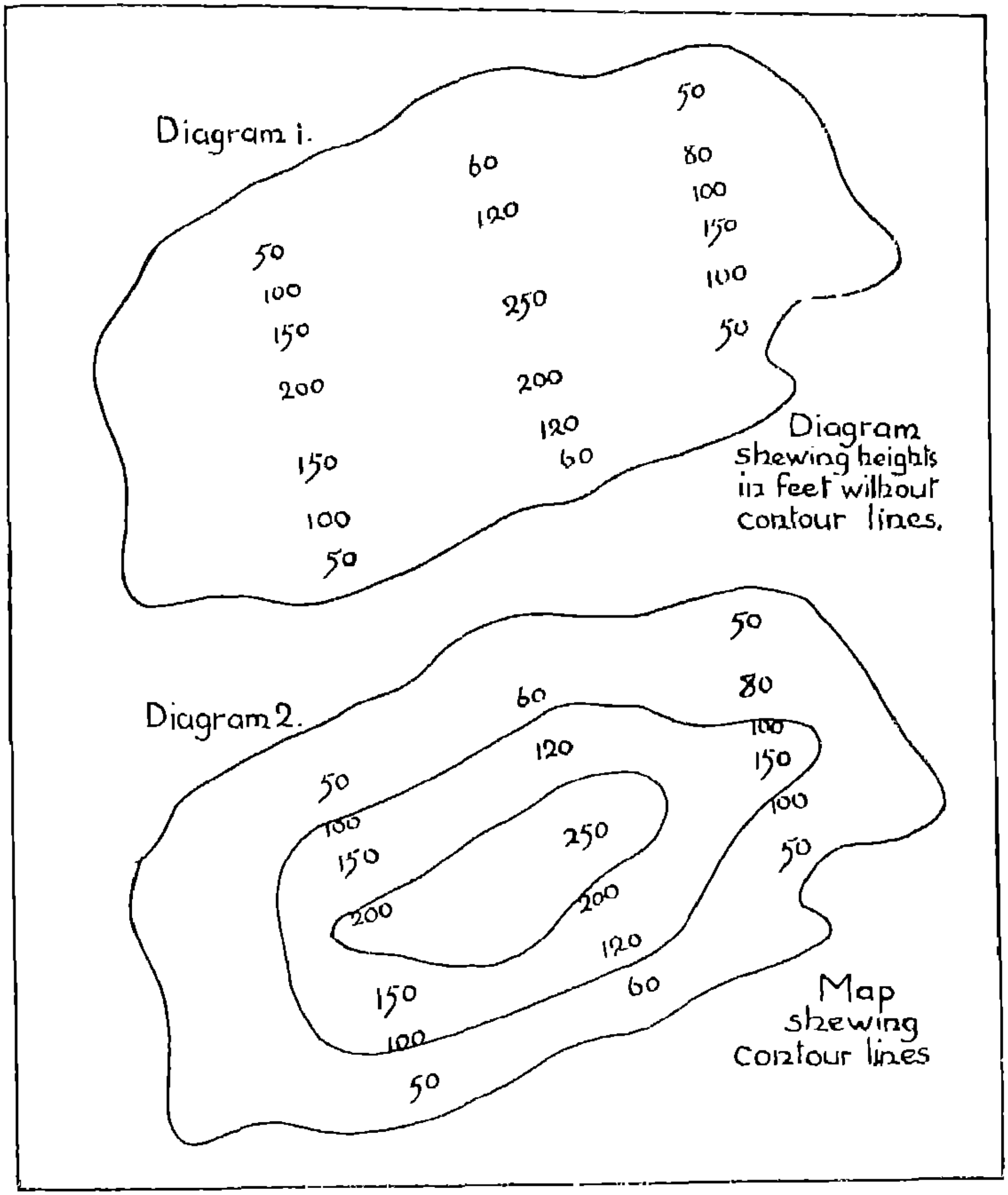


FIG. 10

An Exercise in Contours

in studying the shallow and deep parts of the ocean as shown by contours in their atlases and in noting some of the chief fishing grounds.

Tracing from the 6-in. Map

Brighter children in the upper part of the Junior School may be shown how to take tracings from the Ordnance Survey map, though care must be taken to see that the map is not marked when tracing paper is used. The best way to preserve the map is to cover it with glass.

The simplest tracings will be—

(*a*) Main roads, railways, and canals, illustrating lines of transport.

(*b*) Parks, playing-fields, and allotments.

(*c*) The village in relation to roads, railways, and river.

(*d*) The distribution of woods, arable, and grass fields.

(*e*) Local works and factories and their relation to lines of transport.

These maps, which will prove very useful abstracts, should be traced on to stout paper and preserved for future use.

7. *Survey of Locality: The Spirit of Exploration*

The survey of the home district forms a very important part of the geography scheme. The children should be encouraged, as early as possible in the school course, to observe for themselves, to compare and contrast, and to endeavour to associate cause and effect. It must be repeated that the suggestions which follow are not intended to be taken as indicating the ground to be covered in any one year. This so-called Home Geography may be spread over the three or four years of the Junior Course, and the method of treatment will depend upon the advantages or difficulties offered by the locality in which the school is situated.

Home Exploration

In many ways the town child is at a disadvantage as compared with the rural child in this matter of direct observation. The country child may be led to see the effect of natural influences on scenery; he may trace the course of the brook; he may learn something of the action of running water in forming the river valley; he may, by direct observation, understand the meaning of the term "watershed."

The town child, on the other hand, can see but little of these natural processes. He, however, gains an earlier introduction to economic geography, for he may have a first-hand opportunity of noting the reasons for the growth of a city, and the rise and spread of its industries; he may live near great railway termini or world-famous docks.

Preparing for the "Field"

Careful preparation is needed before any form of outdoor work is undertaken. Each ramble must have a definite aim, and the pupils should know what they have to look for and why they have to look for it. If an orderly preparation is made, they will return to school from their ramble conscious of having achieved something. They will retain vivid memories of their explorations long after they have forgotten the routine work done in school. On the other hand, an aimless ramble will satisfy neither pupil nor teacher. The teacher will find it difficult, and sometimes impossible, to lecture out of doors. Questions will be asked, of course, both by teacher and pupils, but many of the answers will best be given during the next Geography lesson in school.

River Currents: A Ramble

This aspect of local geography always makes a strong appeal to children. An interesting ramble may be taken along the banks of the nearest brook or river—a "jumpable" brook will prove the most effective for the purposes of direct observation.

The children probably know the cause of the smoothness of pebbles and will realize that a swiftly-flowing stream—[why is it swift?]—carries sand and gravel along, but that when more level land is reached the sediment is dropped, causing sandbanks and raising the river bed in certain places. The children will understand this "silting" if they obtain some river water in a bottle and observe the deposit after it has been standing for some time.

They will note by observing the course of the local brook or river that a curving stream slowly tends to change its course. The current cuts into one bank, causing a "bluff," while on the opposite side of the stream the sediment is dropped more rapidly than elsewhere, since the current is slower. Here a new bank is being slowly raised. Thus, each "bulge" tends to become greater.

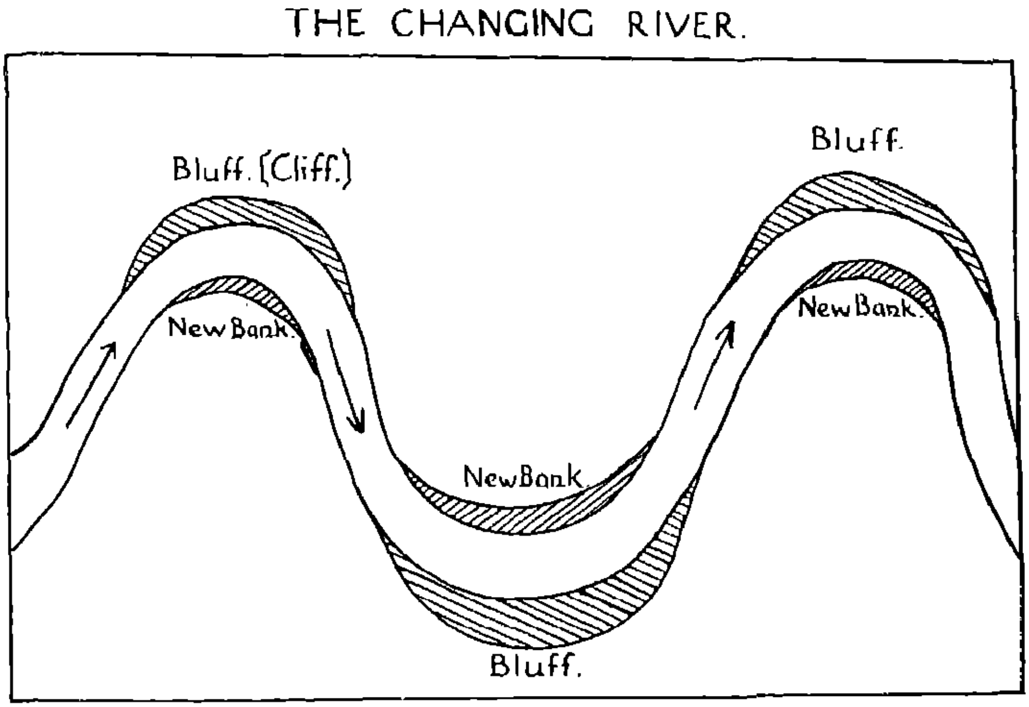


Fig. 11

If children are allowed to drop paper boats or corks into the stream, they will learn a great deal about direction and rate of flow, eddying currents, and silting.

This direct observation of the working of one of the most important of Nature's sculpturing tools will open up a new train of thought to the pupils. They will begin to understand the following facts.

1. That the steeper the descent, the straighter will be the course of the river.

2. That the greater the number of windings of the river, the more navigable it becomes, since the friction at the turns acts as a brake.

3. That periodic floods are often a blessing in disguise.

4. How sandbanks and deltas are formed.

5. The use of a dredger at river mouths and dock entrances.

6. That when a river passes through a town, embankments are built to prevent the cutting away of the river bank.

The children will also gain, by direct observation, an idea of the source of a river, of how tributaries join the parent river, of a river basin, and possibly of a watershed. The story of a raindrop has infinite possibilities.

When the children return to the classroom they should be encouraged to discuss what they have observed, to draw a simple map of their survey and possibly make a relief model in plasticine or sand. The local 6-in. Ordnance Survey Map will prove of great assistance both for their map drawing and their modelling.

How and Why

Another interesting ramble with Junior pupils, where conditions are favourable, is to cross local hills or valleys, at the same time tracing the path taken on the 6-in. Ordnance Survey map. Children will note the contour lines, and more fully appreciate their meaning. This ramble will prove of greater geographical value if they can see and examine a spring, a railway cutting, or a quarry. When they have asked or answered "Why?" many times, they will be doing more than "seeing"—they will be "observing"—they will be tasting the joys of the explorer.

Other Rambles

No two schools are alike either in opportunity to observe natural processes or in teaching methods. Each school must work out its own salvation in its own way. It is enough to say here that the enthusiastic teacher, be he in town or country, will find ample opportunities to arouse the children's interest in what is going on around them.

The following are further suggestions for group rambles and local observation—

1. The local canal; when and why built; the use of locks; competition with railway and road transport; speed and freight costs.
2. The gravel pit or quarry; an insight into the long, long ago.
3. Docks and harbours; reasons for position and growth; the romance of shipping.
4. Coast scenery; erosion.
5. The railway station; railways and roads; the great main roads; chief factors governing direction of these; the old Roman roads; kinds of goods carried; where from and where to; where greatest speed; why?
6. Local manufactures; incoming raw material; where from? dependence upon products of foreign countries; ultimate destination of finished articles.
7. Agriculture; kinds of crops; sowing, reaping, transport; value to the community.

Notebooks

Whichever form this outdoor geography takes, it will lose much of its value unless some record is kept. The notes, sketches, or maps may be crude, for we must not expect too much from Junior pupils, but, whatever is attempted should give some indication of actual observation and reasoning, and a logical order in setting out should be aimed at. An individual or group book will be built up from the rough notes.

Bibliography

The following books, dealing mainly with earth sculpture, may prove useful to teachers of physical geography. The list is, of course, by no means exhaustive.

The Scientific Study of Scenery, by J. E. Marr.

The Wonders of the Earth's Crust, by H. E. Taylor, F.R.G.S.

The Scenery of England, by Lord Avebury.

Making Local Surveys, by Charlotte Simpson.

English Coastal Evolution, by E. M. Ward.

Rivers and Lakes, by M. C. Hinton.

8. *Simple Seasonal Observations*

All children are interested in the weather, in so far as it affects their daily lives. The state of the weather and the season of the year are deciding factors in what games they shall play, what clothes they shall wear. They have gained some knowledge of how the weather affects animal and plant life; they know the significance of the terms "seed-time" and "harvest."

In the Junior School, the aim of the teacher will be to collect up these daily and seasonal experiences and to encourage the children to form the habit of keen and continued observation.

The wise teacher will make no attempt to distinguish between geography and Nature study in these lessons; Nature observations and the study of the weather are inseparable. The title of the lesson matters little; the habits formed and the knowledge gained are all-important.

Weather Charts

Even the youngest children, before they have had lessons on the weather-vane, may record the weather on a monthly chart hung on the wall. The symbols used at first should be pictorial: the thumb-nail sketches given in some daily newspaper forecasts are excellent for the purpose. As an alternative, the teacher may invent simple symbols indicating changes in the weather. The children may cut out, ready for use as occasion arises, several silhouettes of an open umbrella for wet days, a bird singing on a bough for fine weather, and Humpty Dumpty falling for unsettled conditions.

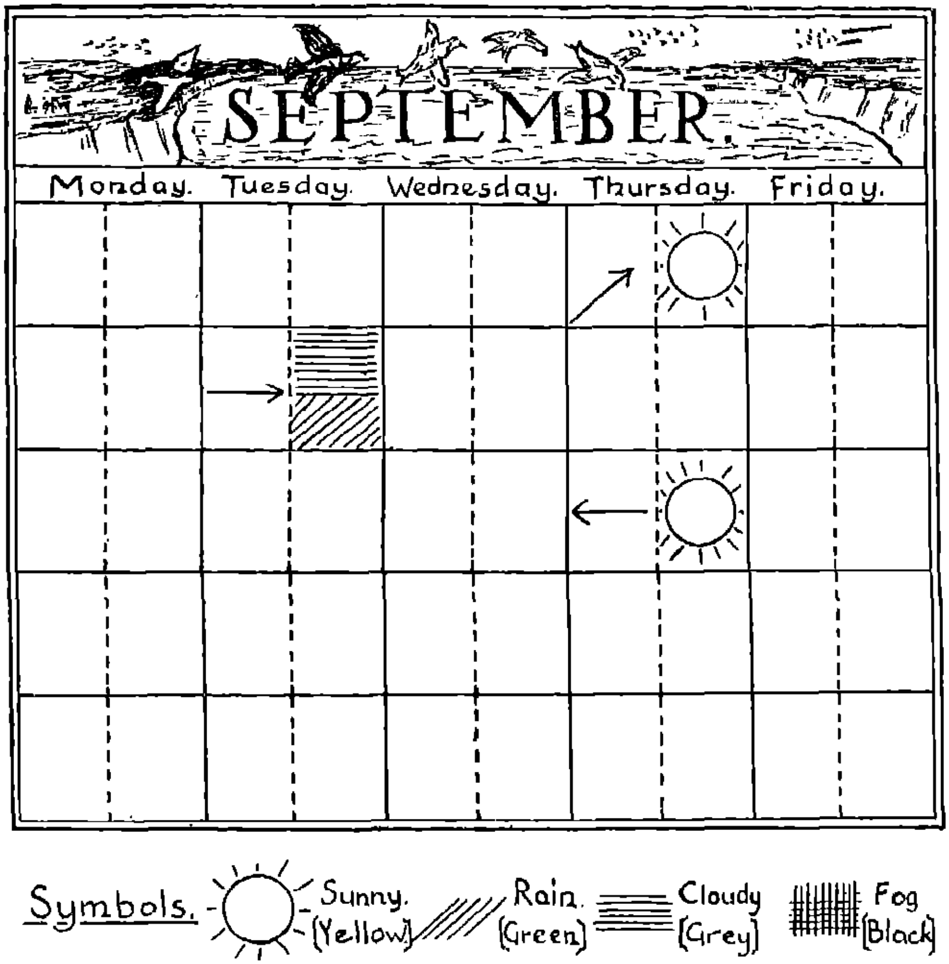


Fig. 12

A Weather Chart

When the children understand the direction of the wind, they may keep a more accurate record in their geography notebooks, and a similar record may be kept on a large sheet hung on the classroom wall.

In a chart such as Fig. 12 the weather is indicated by coloured symbols or markings in coloured crayons: yellow for sunny days, green for rain (showing the effect of rainfall on vegetation), grey for dull or cloudy days, and black for fog. The direction of the wind is shown by arrows pointing *from* the direction from which the wind is blowing.

On this chart, records may be made twice daily if necessary. Instead of the symbols, coloured papers may be gummed on the chart; the same colours may be used. Sunshine, cloud, and rain may all be shown on one day, if necessary, by different-sized pieces of the coloured papers. This method may be used to make a quantitative summary, at the end of each month, of amount of rain and sunshine, and of wind direction. It makes a visual appeal.

If the records are examined at the end of the year, the children will gain some idea of the wettest month, the months with the most sunshine, and the prevailing winds and their effect upon the weather. They will notice that winds from the north and east are generally accompanied by fine weather, while winds from the south and west generally herald cloudy and wet periods.

The teacher will also point out that the weather brought by the winds differs according to the season; the east winds are bitter in winter and spring, but herald fine, sunny weather in summer. The north wind, again, brings snow in winter, but not at other times of the year.

Poems and "Saws"

During these talks about the winds and the kinds of weather they bring, the teacher may like to read to the children John Masefield's beautiful salt-water ballad, "The West Wind"—

It's a warm wind, the west wind, full of birds' cries.

Children will also be interested in the many weather "saws"—

The North Wind doth blow, and we shall have snow.

A red sky at night is the shepherd's delight,
Red sky in the morning is the shepherd's warning.

This forecast is given at greater length in the following lines—

Evening red and morning grey
Help the traveller on his way.
Evening grey and morning red
Pour down rain upon his head.

Rain before seven, fine by eleven.
It will clear up if there is enough blue in the sky to make a pair of breeches.

The children will enjoy Tom Hood's oft-quoted "No!" which begins—

No sun—no moon!
No morn—no noon—
No dawn—no dusk—no proper time of day—

and concludes—

No shade, no shine, no butterflies, no bees,
No fruits, no flowers, no leaves, no birds—
November!

A Wind Chart

Fig. 13 shows an excellent method of keeping a wind chart. It is a modification of a method recommended by Dr. Unstead, and is suitable for the upper class of a Junior School. Each child may keep his own record, or the weather may be indicated on a large sheet posted on the wall of the classroom. The weather for each day may be shown by means of hatchings as indicated in the key or by various colours. Changes in the weather during the day may be shown. For instance, in Fig. 13, on 4th November, the wind was blowing from the south-west, and fine and dull periods were experienced. 20th November was frosty, or cold, and dull, but dry. The children will notice the general absence of rain, though the wind was from the south-west on ten days. They will be interested to compare the south-west wind in November with the April record.

One advantage of this method of keeping a wind chart is that the prevailing winds for a month or a season are easily totalled. A comparison of the number of days on which certain winds blow throughout the four seasons of the year is a valuable and interesting exercise.

Hygrometers

1. Most of the children will be familiar with the weather-house in which two figures swing

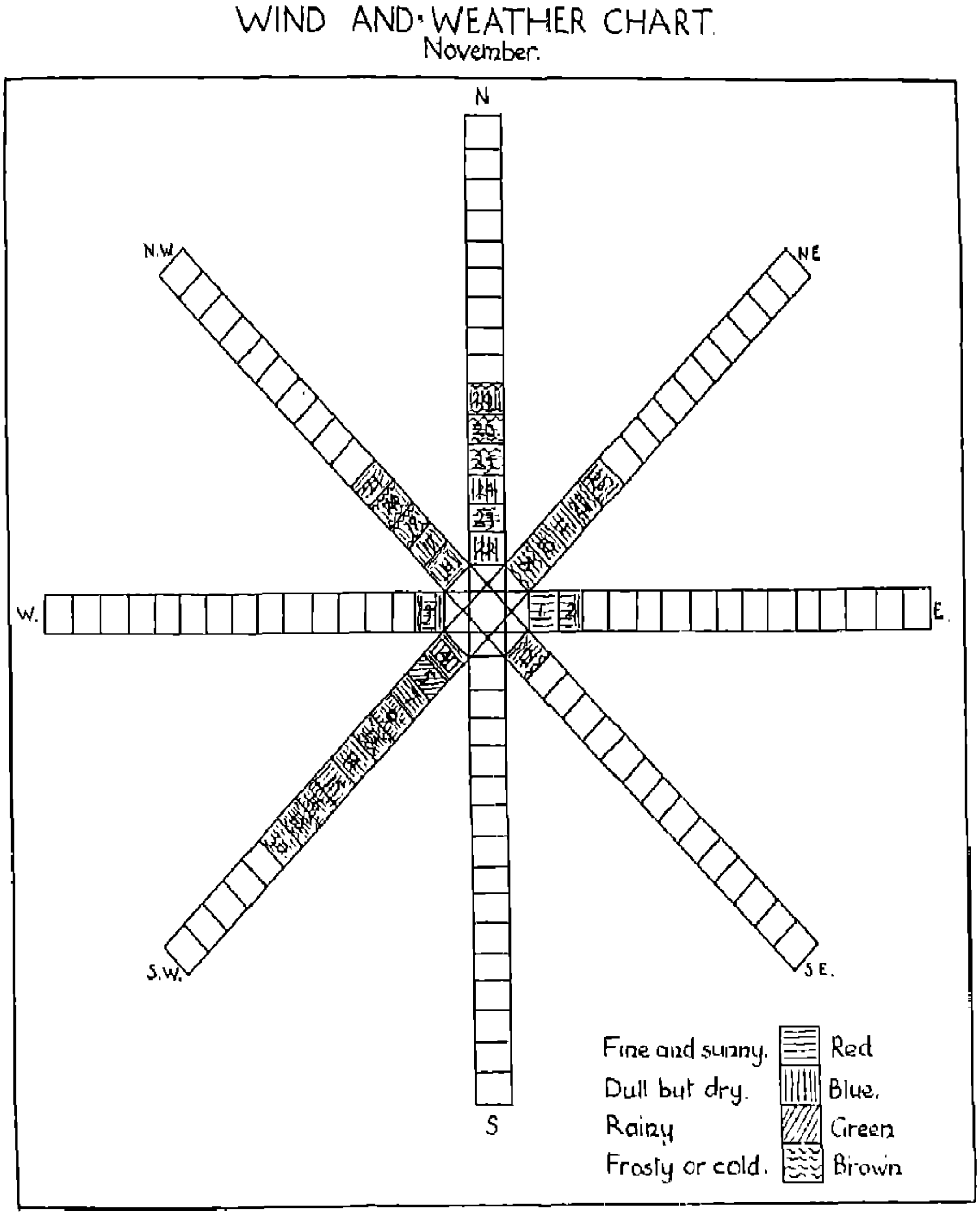

WIND AND WEATHER CHART
November.
N
N.W.
NE
W.
E.
S.W.
S.E.
S
Fine and sunny. ▤ Red
Dull but dry. ▥ Blue.
Rainy ▨ Green
Frosty or cold. ≋ Brown

FIG. 13

through doorways, their movements being controlled by the moisture in the air—or the dryness of the atmosphere—acting on a stretched piece of catgut.

2. Another old-fashioned way of finding whether the air is damp or dry, and whether rain may be expected, is by hanging up a piece of seaweed. Before rain, it will be damp and flabby, but in dry weather it will be quite hard.

3. A jar of salt on the classroom shelf will serve as a crude hygrometer. The humidity of the atmosphere is shown by the moist nature of the salt. When the air is comparatively dry, the salt will feel crisp to the touch.

THE WEATHER VANE

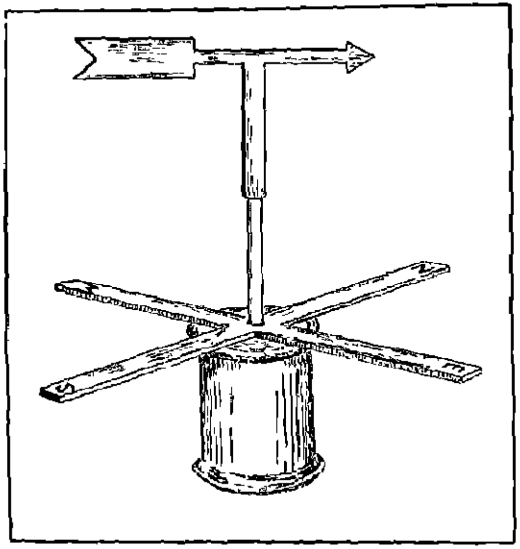


Fig. 14

The Weather-Cock

Before the children can insert the direction of the wind on their record chart, they should study the construction and working of the weather-vane.

If the teacher calls their attention to the weather-cock on the school tower, it will be found that many of them have but a very hazy notion of its use. Let them watch the weather-cock and find out whether the direction arms move or the vane. Once their attention has been attracted they will become observant of wind direction, and the daily record should offer little difficulty.

A simple model, as shown in Fig. 14, may be made in the Handwork lesson.

The vane may be cut from cardboard—the tail having a much larger surface than the arrow, which is intended to point to the direction *from* which the wind is blowing. The cardboard vane may be fixed to a wooden shaft which should turn freely in the hole through the direction arms and the cotton reel.

CHEESE BOX WEATHER VANE

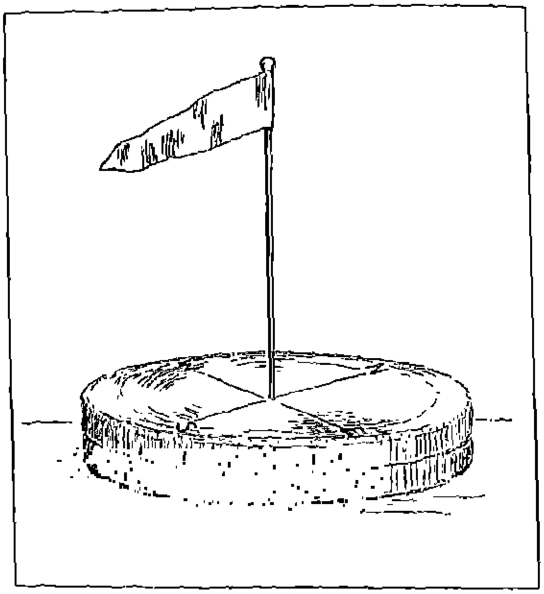
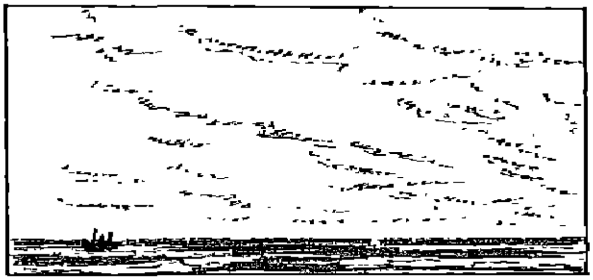


Fig. 15

A still simpler model may be made by using a hat pin or a knitting needle with a paper flag as a vane. The flag must be so fixed as to swing freely round the fixed needle, which may be stuck in a little round cheese box on which may be marked the cardinal points. A silk or linen flag serves well in a strong wind, but is not so sensitive as a vane in a gentle breeze. A cork fitted inside the cheese box and pierced by the needle will help to keep it taut and upright.

Simple Cloud Forms

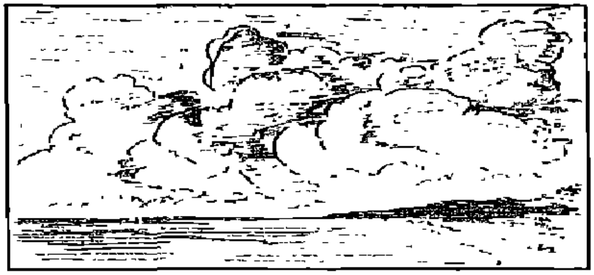
Cirrus



6–9 mls.

Mare's Tail

Cumulus



3–5 mls.

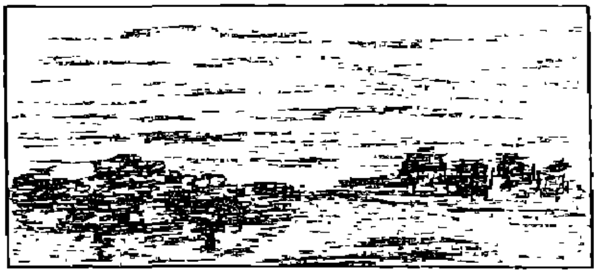
Wool Pack

Nimbus

1–2 mls.

Low Rain Cloud

Stratus



1 mile

A Layer

FIG. 16

Clouds

At this stage the children will be interested in the ever-changing appearance of the sky, and the various forms of clouds.

A simple explanation can be given in reply to their questions as to what clouds are, and how and why they move. They will remember that clouds are visible moisture, and if they breathe on a window or place a jug of cold water in a room and notice the outside of the jug they will form a simple idea of condensation. They have seen a fog or mist, and from their observations they may be encouraged to answer many of their own questions.

They will be particularly curious to know what it is like above the clouds, and whether an aeroplane can avoid fog and mist by rising to a higher altitude.

They will be satisfied at this stage with the statement, put as simply as possible, that rain is the result of the cooling of clouds and the consequent condensation of the moisture in them. They will begin to understand that the prevailing winds in this country—from the west and south-west—gather up moisture as they blow over the ocean.

[Why are winds from the east dry winds?]

The children may like to learn the names of some of the forms of clouds: the very high, feathery cirrus, the woolly masses termed cumulus, the heavy, black rain cloud called nimbus, and the low-lying, straight-lined stratus. This is a rough classification. They may also notice the cirro-cumulus, or "mackerel," sky frequently seen during warm, dry weather, and the very common cumulo-nimbus, a rock-shaped cloud which brings showers.

The teacher of geography will find much interesting information concerning the weather in the following books—

Simple Lessons on the Weather, by E. Stenhouse
Weather Book, by J. H. Elgie.
Science and the Weather, by W. B. Little.

FIG. 17
The Geography Room: A Lesson on the Weather Vane

9. *The Earth and the Sun*

The daily rotation of the earth on its axis and the annual revolution of the earth round the sun may simply be accepted as facts in the geography course of the Junior School. The term "apparent path of the sun" will suffice at this stage.

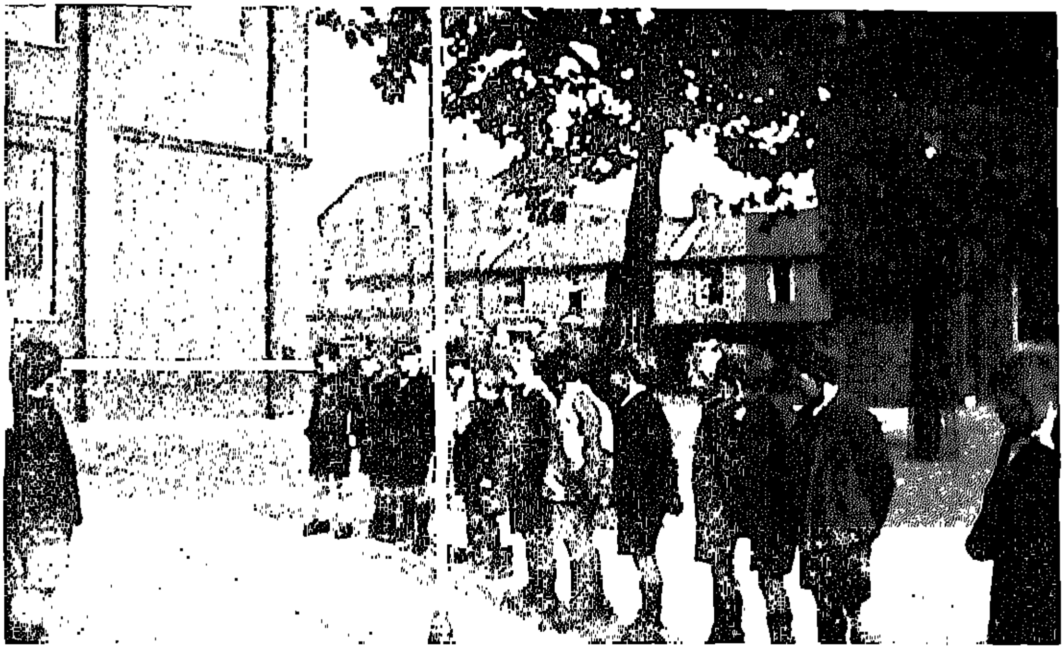


FIG. 18

The Sun's Shadow at Noon

Sun and Shadow

To find the North by means of the shadow cast by the sun, the simplest experiment may be performed by the use of a pole or jumping standard set up in the playground.

Let the children measure the length of the sun's shadow at intervals between 9.30 a.m. and 3 p.m. They will notice that the shadow is shortest at 12 noon, i.e. the sun is highest in the sky at noon. *The shortest shadow points to the North.* This time is, of course, true or sun time, not necessarily Greenwich time.

The fact that the sun is *exactly* in the south at noon *on only 16th April, 15th June, 1st September, and 24th December*, is beyond the scope of the work of the Junior School. The matter is further complicated if observations are made during the period when "Summer Time" is observed. The experiment is better performed during the winter months.

If this line of the shortest shadow is compared with that given by the compass, the children will see that the "compass North" is slightly west of the "shadow North," which is true or geographical North.

Magnetic declination must be left till the Senior stage is reached; the Juniors must be content, at present, with the knowledge that the shortest sun shadow in the northern hemisphere points to the North Pole, but that magnetic declination varies in different parts of the world.

Sunrise and Sunset

During the winter months, the children may *observe for themselves that the sun appears to* rise in the east and to set in the west. They have also noted that the sun's shadow is shortest at noon, that is, the sun is highest at noon, and that the sun appears to describe an arc in the sky from dawn to sunset.

Now let them consider the variations in the length of daylight. From an almanac they can compile a table of the times of sunrise and sunset for the first day of each month.

SUNRISE AND SUNSET

	a.m.	*p.m.*
1st January . .	8.6	4.1
1st February . .	7·40	4·48
1st March . .	6.46	5·40
1st April . .	5 37	6.32
1st May . . .	5·33	8.22
1st June . . .	4·49	9·7
1st July . . .	4·47	9.20
1st August . .	5·23	8.49
1st September . .	6.12	7·47
1st October . .	7.0	6.38
1st November . .	6.53	4·34
1st December . .	7·43	3·54

(The above times include "Summer Time.")

Direct and Slanting Rays

The children have been encouraged to notice the height of the sun at various times of the day and at different times of the year. The inclination of the earth's axis at an angle of 66½° to the plane of the ecliptic is beyond the understanding of most of the Junior children.

In order, however, to give them a simple explanation of the seasons, let them study a diagram as shown in Fig. 19, which will help them to understand that the effect of the sun's heat on any part of the earth's surface depends on its height in the heavens.

The amount of heat received at any part of the earth's surface is determined mainly by the angle at which the rays of the sun reach the place concerned, that is, the height of the sun above the horizon. The greater the slant of the rays, the greater the diffusion. In Fig. 19, the vertical ray striking the ground is concentrated on the space having the breadth *a–b*. As the slant becomes greater, that is, the lower the sun is in the sky, the heat and light are spread over a greater area, and are consequently weakened. The children may understand this the more readily if the ray is likened to a beam from a bull's-eye lantern shining at varying angles on a dark surface. Let them compare the area of the ellipse with that of the circle.

They will then begin to realize that regions round the Equator are the hottest because there the sun is overhead at noon, the rays are more direct than they are farther north and south.

The Seasons

The children may now be encouraged to find some reasons for the change of seasons. It has already been pointed out that the inclination of the earth's axis must be discussed at a later stage. They will recognize that, though the sun is never directly overhead in the British Isles, yet during June, July, and August we experience our hottest weather, for then we have long days and short nights, and the sun is higher in the heavens at midday than at any other time of the year—in other words, the rays are most direct at this season. In winter, however, the days are at their shortest, and the sun at midday is at its lowest.

An informal talk on the seasons of the year, and the kinds of weather generally experienced during the various seasons, will provide the teacher with many interesting topics at this stage.

10. *Latitude and Longitude*

Opinions differ as to the advisability of introducing this subject into the curriculum of the Junior School. Obviously, there are mathematical difficulties, but the curiosity of the brighter children may be satisfied by a simple explanation of this intricate framework of lines, leaving until the Secondary stage such difficulties as the altitude of the Pole Star, the calculation of time at various places, the International Date Line, and the gain or loss of a day in going round the world.

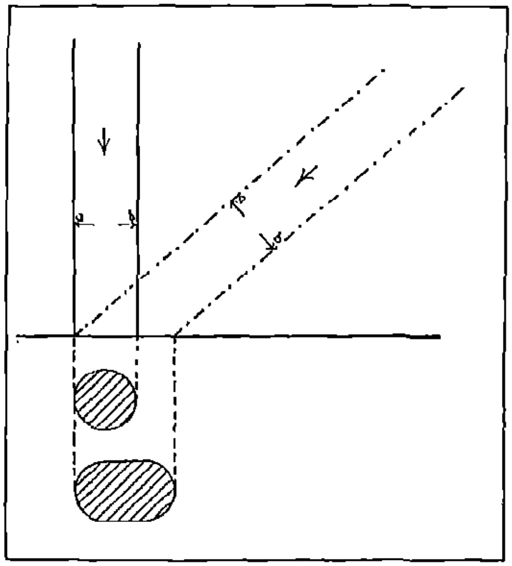
Latitude

The teacher may mark in chalk on the school globe the Equator and other circles parallel to it. These circles get smaller as the poles are approached. All places on any one of these imaginary circles are equidistant from the Equator, that is, they are *in the same latitude.*

Latitude, then, is distance north or south of the Equator, measured in degrees, the Equator being 0°, and the North Pole 90° N.

Let the children find the degrees of latitude between the Equator and one of the circles drawn on the globe. Let them also find the latitude of a place half-way between the Equator and the North Pole.

DIRECT AND SLANTING RAYS OF THE SUN.
A Beam from a Lantern.



The heat and light from the oblique beam are spread over a greater area, and are consequently weakened.

FIG. 19

They may then be asked to find a place 40° N. lat. They will require further directions before they can point out any definite position on the parallel.

The first idea of longitude may now be introduced.

Longitude

On the school globe draw, in chalk, a circle passing through London and the two poles. Now draw another great circle so that the distance around the globe is divided into four equal parts. The children will see that other circles can be drawn until the Equator is divided into 360 equal parts, and that all these circles are equal, and that they all pass through the poles and cut the Equator at right angles. Each is called a meridian of longitude (L. *meridies*, midday), because every point along each of them has its midday at exactly the same moment. The space between one meridian and the next is called one degree of longitude.

MERIDIANS & PARALLELS.

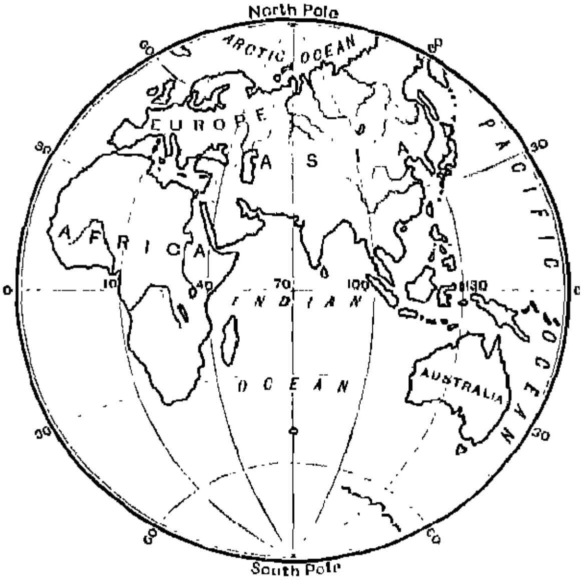


FIG. 20
Latitude and Longitude

Let the children consider whether the degrees are equal in every part of the world and where a degree is greatest.

Longitude in most countries is measured in degrees east or west of the meridian passing through Greenwich. The measurements read from 0° at Greenwich to 180° eastward and westward.

Degrees of Latitude and Longitude

Next let the children consider the length of a degree. A degree of latitude measures about

69 miles. (The earth's circumference, 24,900 miles, divided by 360.)

A degree of longitude measures about 69 miles at the Equator, its length becoming less as the poles are approached. Thus, at London, 51½° N. lat., a degree of longitude measures about 42 miles.

The children will now begin to realize that the position of any place in the earth can be defined if we know—

1. Its latitude, or distance north or south of the Equator.

2. Its longitude, or distance east or west of the meridian which passes through Greenwich.

Exercises

The following are simple exercises which may be performed by the children to familiarize them with parallels and meridians, and with the positions of various places on the earth's surface.

1. Draw a white chalk line on the floor of the room, or on the playground, to represent the Equator, and stretch a rope on the ground at right angles to represent the meridian passing through Greenwich. Divide the class into four teams. Instruct one team to line up on the Equator, the second on 10° N. (a step for a degree), the third on 20° N., and the fourth on 10° S. Each line forms part of a parallel of latitude. Then let them take their stations on various meridians of longitude. They may be shown that these meridians are approximately parallel only on maps representing small areas.

2. Define the Equator and the Greenwich meridian as above. Let the children imagine the room as the Atlantic, and let them place paper boats in 70° W. long., 30° N. lat., 40° W. long., 30° S. lat., and so on (one step may represent 10°).

3. Let the children rule lines on squared paper to represent the Equator and the Greenwich meridian. Counting each square as a number of degrees they may mark (*a*) 15° N. lat., 30° E. long.; (*b*) 25° S. lat., 50° W. long.; and so on.

4. Let them write down the latitude and longitude of any cities they choose.

5. Give the children the latitude and longitude of various places and let them locate them—

(*a*) 51½° N. lat., 0° long. (London.)
(*b*) 49° N. lat., 2½° E. long. (Paris.)
(*c*) 53° N. lat., 13½° E. long. (Berlin.)
(*d*) 23° N. lat., 90° E. long. (Calcutta.)
(*e*) 30° N. lat., 90° W. long. (New Orleans.)
(*f*) 41° S. lat., 175° E. long. (Wellington, N.Z.)

The longitude of Calcutta, New Orleans, and Wellington are important as representing roughly the distances of a quarter and a half-way round the world.

REGIONAL AND WORLD GEOGRAPHY

> *"A selection of topics which are interesting to children may be made in such a way that while each is more or less complete in itself they may together build up a conception of the world as a whole. . . . the study of the home region should be extended to include some other simple study of the principal geographical regions of the British Isles, and it should not be difficult by the end of the primary stage to show the pupils how these regions are interrelated."*—REPORT ON THE PRIMARY SCHOOL, 1931.

ONE of the first problems the teacher in a Junior School will consider is: What should a child be expected to know by the age of 11? Once this is answered the next problem will be the means of conveying that knowledge to the young student in the most suitable manner.

The first problem is simplified when it is understood that in such a subject as history or geography the pupils of the Secondary School will usually receive a course complete in itself, and, in geography, one that will cover the whole world. Hence the important point about the work in the Junior School will be the *attitude of mind* given to the pupil—an attitude of mind which should give the right atmosphere and background to the future studies.

However, it must be clearly understood that the Junior School should be considered as a complete stage in the life of the child, and as such it should be catered for. Whatever is taken in geography should be such that it will have its appeal to the *Junior*, and not necessarily in terms of the requirements of the Secondary School. As *real things* and *real people* are more attractive to children than abstract things, the first essential in all lessons to Juniors is that the subject should be made as real as possible.

I. *Importance of the Human Element*

The geography taken should be truly *Human Geography*, in so far as the child is helped to understand the details of the lives of the peoples under study, and some of the reasons for them. The definition of geography that the teacher should keep in mind is "the results of the interaction of man with his environment."

Too often the environment is given in great detail, while the human element is either forgotten or treated very summarily. This should not happen in the Junior School. Rather should the emphasis be on the human element, gradually leading up to the more intricate study of the physical environment, which will certainly be dealt with more closely in the various Secondary Schools.

The scheme of the settings taken in class will gradually develop during the Junior School stage, from the obvious differences between, say, the Tropical Forest and the Tundra, to the less obvious differences between the various settings of life in a small country such as the British Isles—as, for example, in the life of the wheat farmer of East Anglia and the life of the cattle and dairy farmer of the Irish Plain, or the life of the cotton spinner of Lancashire and the life of the coal-miner of the neighbouring coalfields.

II. *Scope of the Course*

The pupils should leave the Junior School having had a course of *World Geography*. But the course should be such that vivid mental pictures are easily recalled; there should be nothing vague or beyond the understanding of the child. At the end of the course the pupil will have some appreciation of the world as a whole, and the life and work of the peoples in the various regions. Here the word "region" refers to the large so-called *Natural Regions*. At the same time these regions should be connected in the child's mind with the names of the more important countries where they are found. Toward the end of the course the pupils should be quite familiar with the map of the world and the position of the regions on it.

These excursions into the lives of the peoples in the natural regions of the world will be treated more intricately as the course proceeds, but should lead up to some kind of appreciation of the natural region as the unit of study.

In the last year of the course the British Isles will be taken as the unit of study, and the principles worked out broadly in other parts of the world will be applied to life in our lands. At the same time, world geography will be continued as a background to the study of the British Isles, to make clear the connections of the Homeland with the rest of the world.

1. *For Pupils 7 to 9 Years Old*

This part of the course at first introduces the children to the lands of strange climates, vegetation, animals, peoples and their work—usually totally different from the conditions with which they are familiar at home. In the second year the stories and facts are chosen in order to give an elementary view of the "interaction of man with his environment," in terms of the great natural regions of the world.

This stage of the course might receive some such title as—*Peoples and Children of Other Lands—their Lives, Work, Homes, and Surroundings.*

In choosing lessons for these very young people the teacher should arrange the scheme so that *all* the great natural regions are included—

Tropical Forests, as in Central Africa and the Amazon.

Tropical Grassland, as in the Sudan or Brazil.

Hot Deserts, as in the Sahara, India, or Peru.

The Mediterranean Type of region, as in the lands of the Mediterranean, California, Chile, etc.

Temperate Forests of the broad-leaved forest type, as found in England, Western Europe, or North America.

Coniferous Forests, as found in Canada, Northern Europe, and Asia.

Temperate Grasslands, as found in the Steppes of Asia, the prairies of North America, and the Pampas of South America.

Cold Deserts or the Tundra, as found in Northern Canada and Northern Asia.

With the above regions in view, world geography can be made a very real thing.

At first, life in regions of great contrast should be taken consecutively, in order to make a more lasting impression on the young mind.

A suggested course of pairs of lessons which would fulfil the above conditions of study is as follows.

{The Eskimo of the Tundra coast of Labrador.
The Pigmies of the Congo Tropical Forest.

{Life in a typical village in India.
Trappers and fur traders of the Cold Forests of Canada.

{With the Kirghiz horsemen of the Steppes of Asia.
The rice-growers of the Chinese river valleys.

{The mountain dwellers of Switzerland.
The "Netherlands"—windmills and canals.

{The fruit lands of Kent.
Bananas from Cuba.

{The land of sugar-cane.
Life in the sunny South Sea Islands.

{The Arab camel-men of the Sahara desert.
Life at an oasis in the Sahara.

{A trip up the Amazon.
A trip up the Yang-tse-Kiang.

{On a Canadian wheat-farm.
The Red Indians and cowboys of the Prairie Plains—100 years ago, and to-day.

{Gold-mining in South Africa.
Coal-mining in Yorkshire.

{On an Australian sheep farm.
A tea plantation in Ceylon.

{Salmon fishing in British Columbia.
With the herring fleet in the North Sea.

{Life in the cotton plantations of the Southern States of U.S.A.
On the Pampas of Argentina.

{Lumber and paper in Canada.
On a rubber plantation in Malaya.

Each lesson should be concrete, and should give a vivid picture of life in the region under study. This should include, where possible, elementary climatic data, vegetable life, animal life—and the lives of the people with particular reference to their methods of *earning their livings*.

The teacher will find it useful to consider the types of life in the various regions in such a way that each of the peoples can be fitted into one or more of the following categories—

1. HUNTERS } "Food-gatherers."
   FISHERMEN }
2. HERDSMEN OR SHEPHERDS.
3. CULTIVATORS { of food.
   { of raw materials.
4. MANUFACTURERS or "Makers of things" { by hand
   { by machinery.
5. TRADERS.

By using this method of broad generalization consistently throughout the course, the teacher is able to help the children to remember the chief facts of each type of region much more easily. It also leads up to the study of the complex life in our own lands, where the people earn their livings by doing all the above things.

Two large blank maps of the world could be hung up in the classroom; on one the children could be allowed to stick pictures illustrating the life of the peoples; the other should be placed by its side, the teacher colouring in the various natural regions as they are taken. Similar natural regions could be shaded in at the same time in order to show their recurrence.

Another useful device is to consider the distinguishing features of each region under the heads of *Food*, *Clothing*, and *Shelter* of the peoples studied. The part that is more essentially geographical is to work out *how* and *why* the peoples of any region obtain these necessities of life. By the time they leave the Junior School the children will appreciate the differences between primitive communities that are practically self-sufficing, and modern civilized communities that are based on an intricate economic system of foreign trade.

Even young children can appreciate something of the wonders of a system under which a community is able to obtain its wants from regions in every part of the world. This will be brought out more fully in the next part of the course, most of which will deal with the familiar things of their own everyday life, and how they are obtained.

The wise teacher will so arrange the course that this part extends the child's knowledge of world geography, although it will also often revise what he has already learnt in previous lessons.

2. *For Pupils 9 to 10 Years Old*

This part of the course will consist of a gathering up and an amplification of the previous knowledge of the *Natural Regions of the World*, although much of the subject-matter will be entirely new to the child.

The most important part of the year's work should consist of *Travels Round the World*—in order to trace to their sources the familiar things of everyday life, most of which will come under the heading of—

Our Food, Our Clothes, and Our Shelter

Such a course will correlate world geography with that of our own lands, and will help the children to understand how dependent we are on other races, regions, and peoples.

The headings below suggest the types of lessons required, and their relation to world geography. It is obvious that not all the commodities can be taken in the year, but whichever are taken should, as a whole, be representative of the major natural regions of the world.

Children should follow *the travels* on maps of the world, and should receive some kind of drill in the position of the land masses of the world, the oceans, the countries mentioned, and such things as important rivers and large towns.

A large blank map of the world could be filled up, as the lessons proceed, with pictures (or words) showing the chief goods obtained from various regions and the routes taken.

Familiar Things and How They are Obtained

The following catalogue shows to the geography teacher the possibilities of this method of taking a broad survey of world geography in terms of the natural regions.

FOOD

BREAD. *The wheat-lands of Canada*, the bread basket of the British Commonwealth.
The wheat-lands of East Anglia.

MEAT.
- *Beef.* *The cattle farmer of the English cattle-lands.* Fresh meat.
  Life on the Argentine Pampas. Frozen and chilled meat.
- *Mutton.* *Life on the sheep-lands of Scotland.*
  Life on the Canterbury Plains of New Zealand.
- *Pork.* *The Irish farmer.*
  U.S.A. bacon. Pigs and the maize belt.

FISH. *Fishing off the Dogger Bank* with the North Sea fishermen.
The cod-fisheries of the Newfoundland banks.
Salmon fishing and canneries of British Columbia.

MILK, BUTTER, AND CHEESE. Dairy farming in New Zealand.

Market Gardening. Greens, lettuce, etc. Market gardening round each of the large towns. Why?

Fruit.
The apple-orchards of Kent.
The oranges of Spain.
The French vineyards.
The raisin industry of Australia and California.
The bananas of Jamaica.

Rice. *In the Chinese rice-fields.*

Tea. *The tea plantations of Ceylon or India.*

Coffee. *The coffee-lands of eastern Brazil.*

Cocoa. *The cocoa-lands of West Africa.*

Sugar. *The cane-sugar plantations of the West Indies* (Cuba).
The beet-sugar of Europe and England.

CLOTHING

Wool. *The sheep-lands of Britain.*
Wool-spinning and weaving in the Yorkshire factories.
Life on the sheep-lands of Australia.

Cotton. *On the cotton plantations of the Southern States* (or of India or Egypt).
In the cotton mills of Lancashire.

Silk. *The rearing of silk-worms in China* (or Japan).
The artificial silk industry of England.

Leather. *The cattle-lands of Britain.*
On the Argentine Pampas.
The tanneries of London.
The boot-factories of Norwich or Northampton.

SHELTER. *Houses and Buildings.*

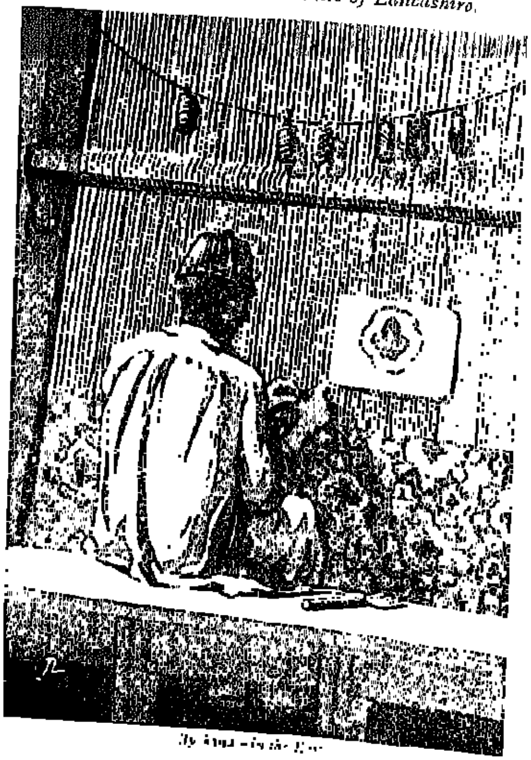
Wood. *Timber from Norway and Russia*—Pine.
The lumber-jack of the Canadian Forest—Pine.
Hardwoods from the Tropical Forests—Mahogany, Ebony, Teak.
Timbers of the Temperate Forests of the British Isles—Oak, Ash, Elm.

Stone. *The quarries of Portland.*
The granite of the Scottish Highlands—Aberdeen.

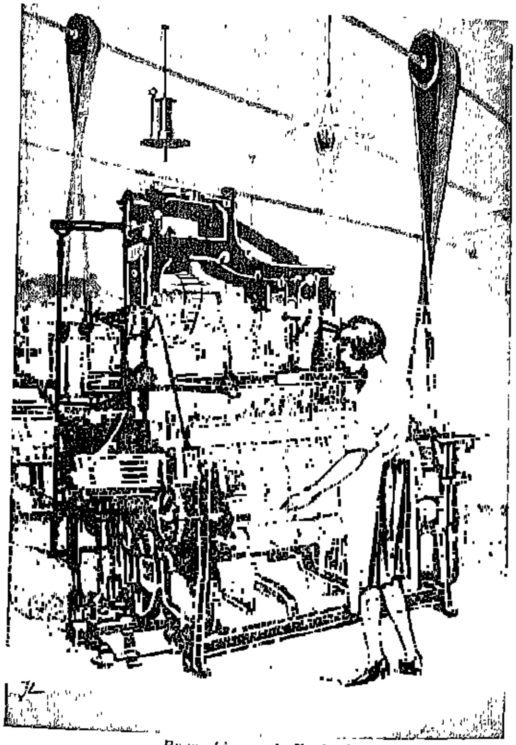
Bricks. *The brick-fields of the London Basin* (clay).

Slate. *The slate quarries of North Wales.*

Iron and Steel. The use of iron and steel in one's home region.
Life in the Black Country.



By hand—in the East



By machinery—in England

FIG. I
Carpet Making

OTHER IMPORTANT FAMILIAR THINGS

COAL.	*Down a British coal mine in Northumberland.*
RUBBER.	*In the rubber plantations of Malaya.* *Collecting wild rubber in the Amazon region, or in the Congo Tropical Forest.*
PETROL.	*The oilfields of Mexico, California, the East Indies, the Middle East, etc.*
VEGETABLE OILS, SOAP, AND MARGARINE.	*The oil palms of West Africa* *The coco-nut palms of the South Sea Islands.* *"Monkey-nuts" (ground nuts) from West Africa. The Ground Nuts Scheme.*
PAPER.	*The paper pulp industry of Canada.* (Forests).

As can be seen from the above list, the regional geography of the world can easily be covered by considering *methodically* the origins of the familiar things of everyday life.

Of course, the list is only suggestive, and can be contracted (or expanded) to suit a particular school's requirements. The important thing to remember is *that the teacher is taking the child on a travel tour*, visiting various parts of the world, and stopping at the regions that he wishes to discuss.

After giving any lesson on the origins of any particular commodity, do not leave the subject in isolation, but trace how the product reaches our own country.

This brings in the question of *Transport* of all kinds—from horses and carts, bullock wagons, camels, llama, to motor-lorries, railways, steamships, and airplanes.

The map of the world should be used freely to follow out the routes. At the same time any striking feature of the physical environment will be noticed on the map, e.g. high mountains of

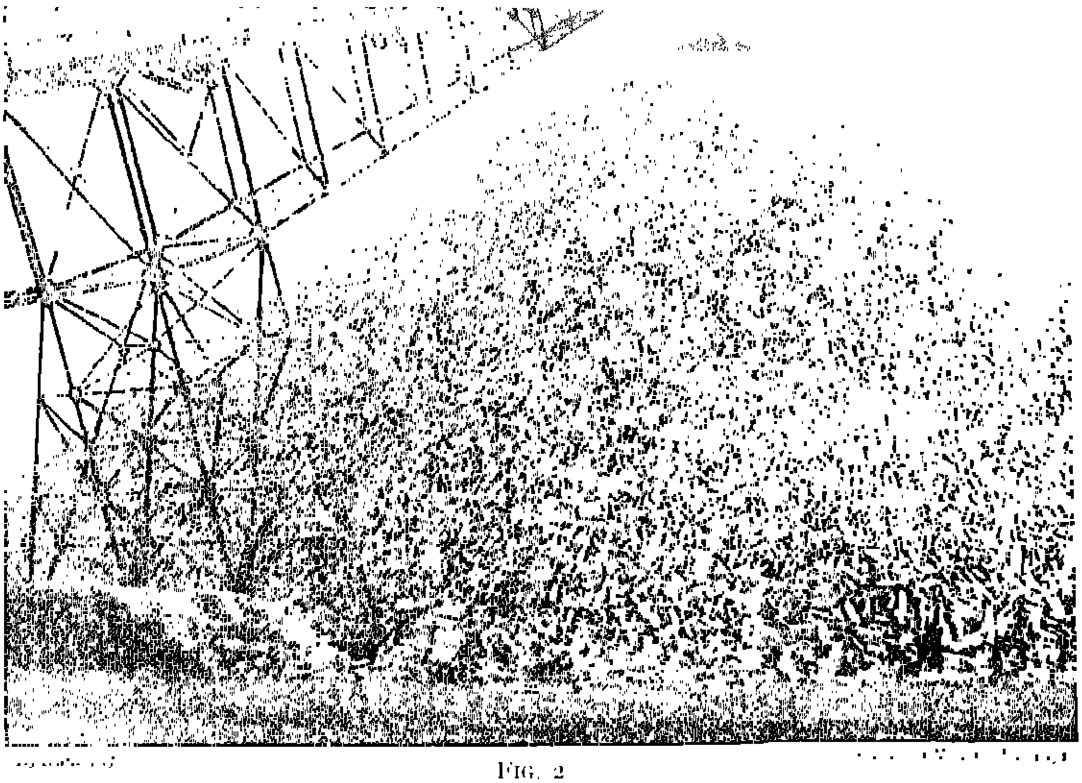


FIG. 2

Pile of Pulp Wood, Port Frances, Ontario the Rockies, the broad plain of the Amazon forest, the north-south river valleys of S.E. Asia, etc.

One way of revising the above would be to take imaginary journeys to various parts of the world, discussing the lives and work of the people of each region.

Stories of Exploration and Travel

Concurrently with the above course of human geography, some lessons should be given on famous travels of all kinds, taking care to use the maps required. This part of the course might be included under the headings—*The Great Explorers of the Past*, (e.g. Marco Polo, *see* HISTORY, PRACTICAL JUNIOR TEACHER, Volume III), and *Famous Travels of Modern Explorers*; but it should not be segregated from the main course. It should be taken almost incidentally, and might be spread through the course as occasion arises. (Note modern *air adventures*.)

3. *For Pupils* 10 *to* 11 *Years Old*

First Regional Study of the British Isles and the Lives of its Peoples. The children have received in the previous years ideas of the interdependence of mankind all over the world—in following the origins of various common articles in use to-day. They have also seen that many regions of the world are almost self-sufficing in the primal needs of food, clothing, and shelter. The study of Life in Our Own Islands should enlarge this knowledge in applying it to the peoples living in the various regions of the British Isles.

To do this geographically, the studies should become more and more geographical in terms of the physical environment of each of the regions, so that each region appears a unit with characteristics different from those of other regions. The characteristics of each region have done much to mould the lives of its people.

For example, England could be divided roughly into—

Agricultural England—where the majority of the people *grow* things.

Industrial England—where the majority of the people *make* things or are *miners*.

This broad classification would, in turn, lead to—

I. The various divisions of agricultural England into a scheme such as—

(*a*) *The Wheat-lands* of the drier Eastern Plain.

(*b*) *The Cattle-lands* of the wetter Western Plain.

(*c*) *The Sheep-lands* of the hills—of the Pennines and of the chalky "downs" of the south.

(*d*) *The Fruit-lands* of the south-east, centre, and south-west.

II. The realization that "industrial England" largely refers to the *Lands with coal*—which can be divided into the regions where specialist manufacture occurs, as follows—

(*a*) *The actual coal-mining areas*; Life in a Northumberland Colliery.

(*b*) *The cotton manufacture of Lancashire.*

(*c*) *The wool manufacture of Yorkshire.*

(*d*) *The iron and steel manufacture of the Black Country, Northumberland*, etc.

(*e*) *The shipbuilding of the Tyne ports.*

(*f*) *The Potteries of North Staffordshire.*

And so on, if time allows.

If the geography lessons are treated in this way the children will begin to realize how the people in the different regions of their own country earn their livings in different ways, and how this will often depend on the peculiarity of the particular region.

Once the above types of livelihood are understood, it will be easy for the children to think of other ways of earning a living that have not yet been mentioned, such as—

Fishing and trading on the sea.

Builders of all kinds—in terms of wood, clay, bricks, stone or steel, etc.

Transport workers—the movement of goods and people. In the latter connection roads, railways, ships and ports would be considered.

Traders—the "middlemen" acting between producers and consumers.

Finally, the child should come to an appreciation of *the work of a large town* or city, and *the work of a large port*—and how towns have risen to the importance they have to-day.

The largest town or port near at hand should be concentrated on at first, but all children should have some knowledge of the wonders of the largest city and port, the commercial and financial centre of the world—*London*.

Throughout these studies of the Homeland, maps of the various regions, and their positions in the British Isles, will become familiar things—they will be the *tools* of the geography lesson.

It is surprising how much geographical information a child picks up, merely by becoming familiar with handling and using well-printed physical maps.

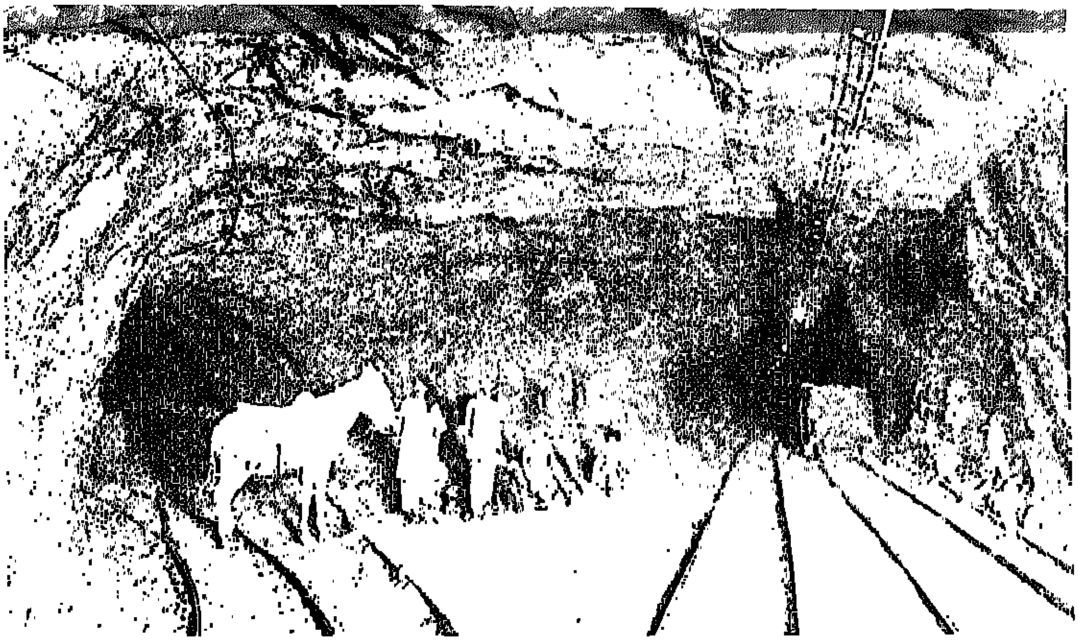


FIG. 3
Salt Mine in Rajputana

III. Maps, and Place Drill

Care must be taken not to overload the geography lessons with a mass of names of places. The geography of the Junior School must be descriptive before anything, but descriptive of *definite* places or regions. Yet certain names are essential, and must be taught—*and known*. Let the teacher decide at the beginning of the year what names he thinks *must* be known by the children—and then see that these are learnt! Of course, this does not mean that no other names are ever referred to. Knowing the name of a place is not of much use if the child does not know where the place is. To ensure that he does know, and will remember, the location of places, he should be given regular *map drill in "place location."* Too often teachers expect children to know everything that has been given in a lesson, or read in the textbook, for the first time. The child should be given time to revise and consolidate his knowledge.

However, do not spoil an interesting lesson by doses of drill in the middle of it. Let the drill be "drill," and isolate it from the real lessons. Possibly three or four minutes at the beginning, or at the end, of a lesson would be the best way of taking this drill.

Once you have decided what the children should know in terms of this drill, *see that they do know it*—but *give them time to learn it!*

IV. Illustrations of All Kinds are Essential

In all teaching of geography the studies should be made real by every device possible. The best method of learning the really vital background of geography is that taken by such fortunate people as those whose work makes them great world travellers.

Our children cannot do this, but the next best thing is to make our lessons as near as possible to what the traveller sees. Here good pictures are essential: no matter how vivid the verbal description, the young child needs their help if he is to retain the definite mental pictures which should be the fruit of the Junior course. The pictures should be as numerous and as good as possible, illustrating every main aspect of the lessons.

There is little excuse to-day for this important part of the instruction to be neglected or minimized through inability to get material. Journals and magazines of all kinds, and even the picture pages of the daily press, cry out to be used in the classroom.

The children will eagerly bring all kinds of material to the teacher, once their interest is aroused; full use should be made of their willing co-operation. Let them make collections of pictures illustrating life in the various natural regions under study. These can be either individual or class collections. But the teacher should see that the pictures are kept together under their various regions. Do not forget the value of posters.

In the imaginary visits made to the natural regions of the world during the Junior course, pictures can also be made to give a very useful background, promoting a fuller understanding of the Secondary School course—especially in terms of the simpler technical words so frequently used. Such words as mountain, gorge, plain, river bends, delta, glacier, iceberg, steppe, prairie, savanna, tundra, tropical forest, coal mine, colliery, factory sites, port, harbour, docks, etc., should recall clear mental pictures whenever they are used.

Too often the child learns to use the words and catch-phrases of geography, while he has little understanding of their real meaning, as would have been obtained if he had seen the actual features concerned. The next best thing to seeing the actual thing is to see some good pictures of it.

In this connection, the business of the teacher should be to enlarge the mental background given by the picture, and to make the appreciation as full as possible.

V. Lantern, Epidiascope, and Film Strips

These also are valuable aids. No school should be without them.

Alas, too often the projector is not used! Yet, even to our most blasé young cinema goers the film strip is still "The films" when it is taken in school time!

If the local education authority has not a collection of lantern slides and film strips, the teacher should ask for one to be started—and could make suggestions! On the other hand, railway companies, museums, geographical associations, and other societies are often only too eager to lend collections of slides or film strips on request.

VI. The Cinema and Geography

The cinema in schools generally is still an advance for the future, but for those schools that have electricity laid on there are one or two cheap and reliable projectors on the market—well within the reach of the more enthusiastic searcher after "visual aids."

But sometimes full advantage is not taken of the local cinema, when it occasionally has a really good travel film of geographical interest.

Even a cowboy picture often gives the correct geographical setting for a study of the ranching prairie-lands of North America—if only the teacher were there to point out the geographical aspect to the pupil! But the teacher should not be afraid to refer to such things in the classroom. Even if much of the talk is lost, yet even the connection of the cinema and the geography lesson helps to make the peoples and places studied more real, and induces a habit of noticing these, and not only the screen personalities.

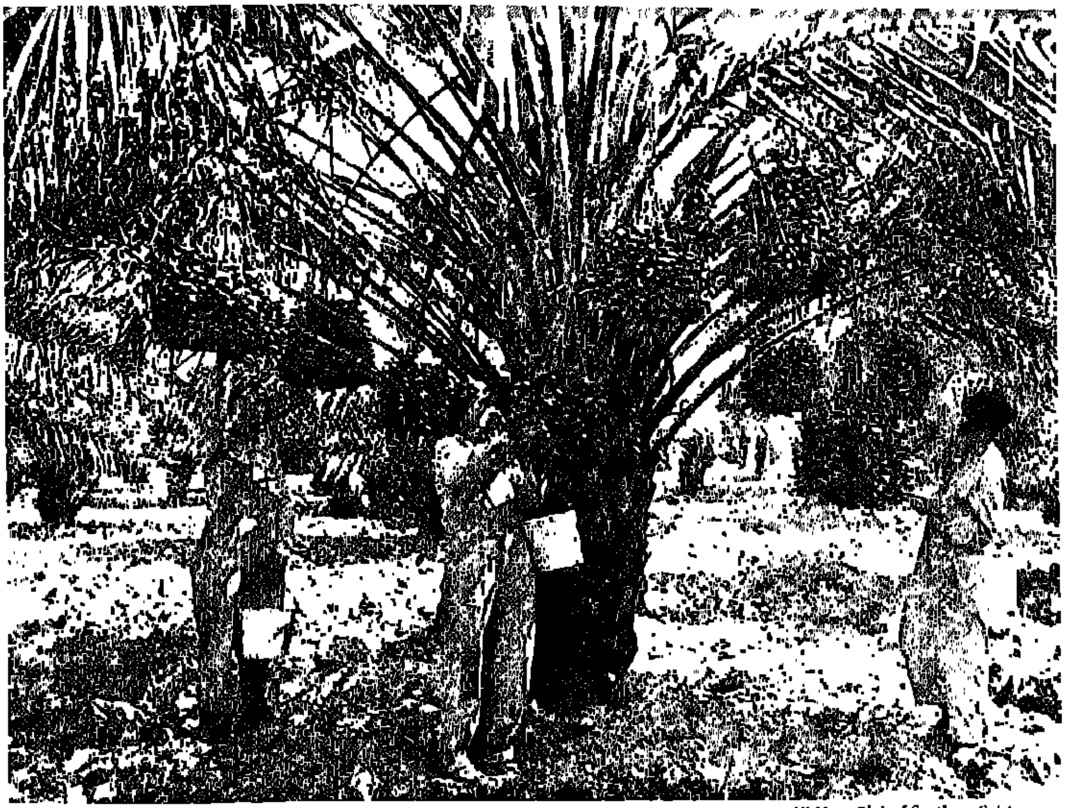
VII. Geography in Terms of the Locality

Of course, on all possible occasions, use should be made of any local geographical peculiarities, so that as many as possible of the geographical ideas can be appreciated practically, e.g. a winding brook will illustrate the meanders of the flood-plain of the Mississippi; a local industry can often be made to illustrate the workings of other industries; the type of crops sown locally can help appreciation of other regions.

VIII. Descriptions

Descriptions should be obtained from real sources, and not from students' geographical textbooks. Usually, the worst thing a teacher can do is to "make them up" from his or her own general knowledge; it is so easy to do, but is it fair to the child?

In the Secondary School a description is better if it is given in the actual words of the writer, but in the Junior School it will usually be wiser if the teacher "interprets" the description into language suitable to the younger pupil.



By courtesy of FIG. 4 *All Year Club of Southern California*

Date-Picking in the Fruit Lands of California

IX. Handwork and Geography

To give good mental pictures models are often necessary. These can best be made on a communal basis—the whole class working with the teacher to gain the desired result. Obviously the teacher must be the planner, designer, and careful watcher, in order to see that the models are accurate in geographical details.

But the above type of work should not be considered the only method of handwork in geography. Drawing, i.e. making copies of homes, weapons, etc.; collecting pictures and arranging and pasting them into books; drawing rough plans or maps—all might be called "handwork" from the teacher's point of view.

Usually—once the facts and vivid mental pictures are given to the class—the more things actually *done* by the children themselves, the more the facts are remembered. "Doing" is a valuable aid to a child's "remembering."

X. *Textbooks for the Junior School*

Most children by the age of entering the Junior School should be able to read.

If this is the case, then there is no reason why some of the reading should not be done from a book giving geographical information.

In this sense a "text" book does not mean a book crammed with dry, bald facts, and with numerous names; such a book would be totally unsuited for a Junior School—it is doubtful whether it would be of use in *any* school to-day. The textbooks for Juniors should be interesting reading, and should have copious illustrations, each of which definitely teaches something geographical. Another test of such a book is that the print, illustrations, and reading matter should make a child *want* to start reading it, and to go on reading it. But such books should be used for real reading (and for "browsing"); they should not be read "round the class."

As well as for their general interest, they should be read with the idea of *getting information*, which is one of the most valuable uses of reading. A suitable book of this kind will have, at the end of each chapter, exercises whose main aim is to ensure that the chapter has been read; if the child could not answer the question after the first reading, he should know that, as the answer is in the chapter, all he has to do is to read the chapter through again more carefully. "Intelligence" tests should be seldom included (if at all) in a school textbook.

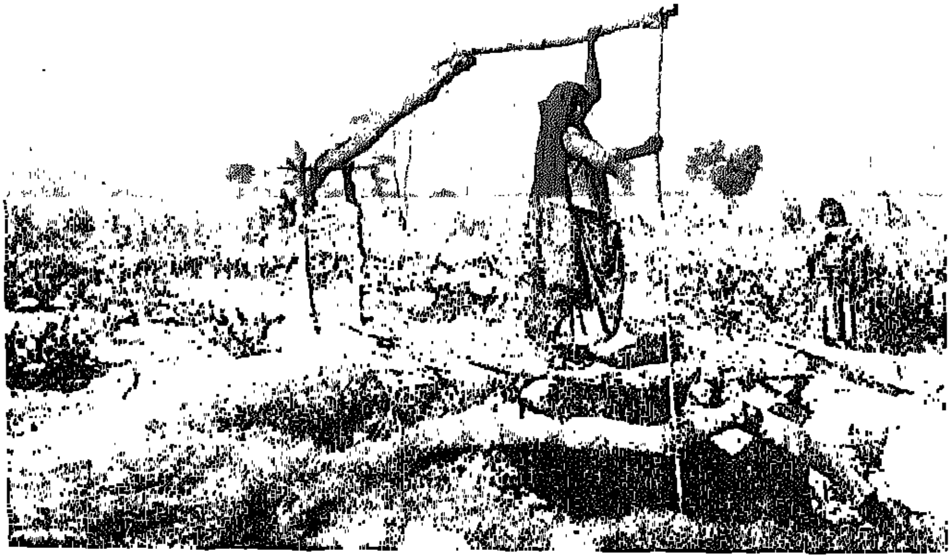


FIG. 5

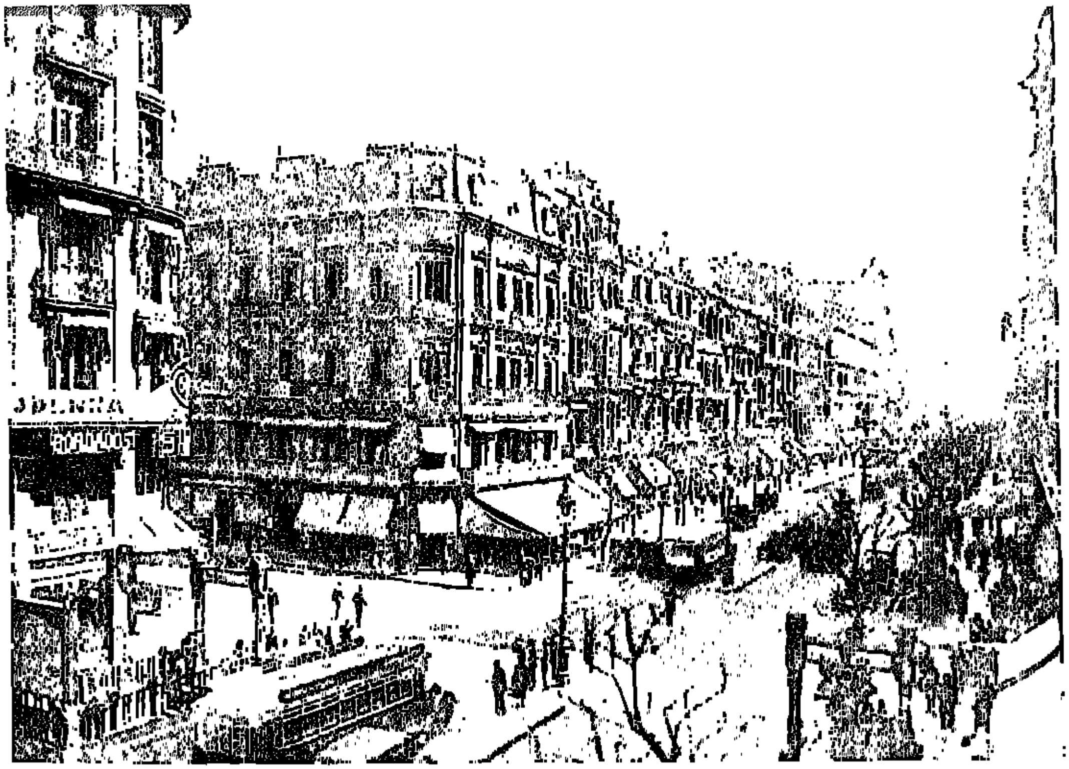
India: Drawing Water in Rampur

WORLD GEOGRAPHY

PEOPLES AND CHILDREN OF OTHER LANDS

THIS part of the syllabus needs great care. The children are too young for much of the technique of geography, and much thought needs to be given to the presentation, so that it is suitable to the child and at the same time geographically correct.

A warning needs to be given to the young teacher, who still has clear recollections of his geography course at college or university. He may discover that he knows very little geography suitable for these young people of 7 to 9 years; and he will quickly find out that considerable research must be done if his lessons on peoples of other lands are to mean anything to his pupils. Here the word "human" is a valuable one to keep in the forefront of the teacher's mind. The teaching material must be made "human" in every sense of the word. The teacher must consider the things important to the child—the things the child is delighted to hear about—and give these things the predominance in all the lessons. The thoughtful teacher will give them their correct geographical aspect. But the teacher must first realize that the job is a difficult one, and has not the straightforwardness of, say, a lesson on "the ports of France"



By courtesy of *Royal Mail Steam Packet Co.*

FIG. 6

Buenos Aires—the largest City in the Southern Hemisphere

(Note buildings, trams, electric light, etc.—all very similar to a town in our own land)

that he may himself have received when a pupil of 16 years.

Once the teacher appreciates the necessity of adapting his subject to the child's mental stage, the battle is half won. The following detailed notes of lessons demonstrate the type of detail for which the teacher should search.

But, the scheme as a whole must always be *kept in mind. In each of the first two years of* the Junior School course the scene of action should be *the world*—and by the end of each year of the course the children should have received some appreciation of *the world as a whole*—even although, during the first year, the child may not understand what a map means.

However, although the seven-to-eight-years-old child may not fully understand maps, yet he should feel that the world is made up of many different places or regions, where the conditions and the consequent lives of the peoples and children are very different from the lives of the people in his own land. He should also receive information of these differences, and a few definite ideas of their causes.

Thus, keeping the geographical aspect to the front, the teacher will have little time for details that are not geographical. For example, no race or tribe should be introduced to the class as something amusing or as "freaks." Any peculiarities should be studied, and reasons for them discovered if possible. Finally, in the case of habits that are difficult to account for to young children, but which it has been thought wise to mention, the teacher should rather point out that, although such habits seem strange to us, many of our habits would seem just as strange to the people they are studying (e.g. the Chinese method of reading from right to left, from the bottom of the page to the top, and from the back page to the front page).

From the earliest age children should be taught to think broadmindedly of the lives, work, customs, and habits of other peoples; and to realize that these peoples have feelings very similar to our own. Hence the fathers and mothers, and the boys and girls, their pets, and their games should all be introduced—in the correct environment—to these young students of geography.

Nothing should be taken haphazard. A syllabus should be made at the beginning of the year, and should be adhered to. That is the most important part of the work of the teacher, or of the one responsible for the instruction of the school as a whole. The "art" of the teacher lies more in this first working out of *the course as a whole* than in the actual teaching done in the classroom. (The teaching is important, but the writer is presuming that all teachers are good teachers, and are expert professionals.)

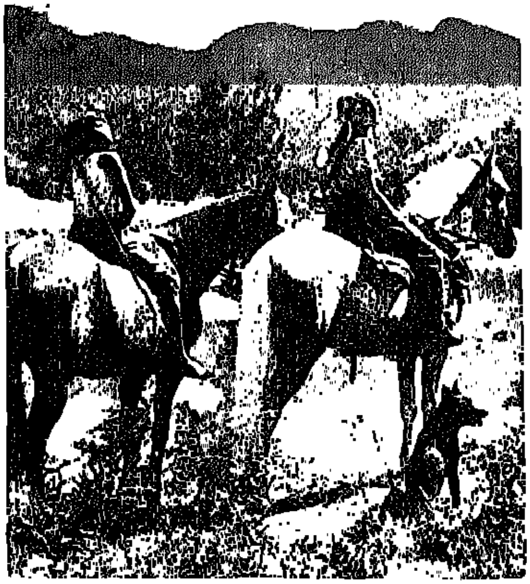


FIG. 7

A White Australian Girl with her Young Aborigine Friend

To illustrate this point—a good course for Juniors would cover all the main natural regions of the world. But, these regions should *not be taken in any order, otherwise the child* may receive *information* only, and information that he is incapable of uniting into a whole. A plan that has been found successful in practice is to take *pairs of regions* of great contrasts, e.g. the *Eskimo* of the Polar fringes, and the *Negro* of the tropical grasslands of Africa. The vivid contrasts in the lives, work, play, pets, etc., bring out sharply the differences in the environments. Such sharp contrasts help more than any other device to fix the geographical facts in the minds of the young.

The suggested course of lessons already mentioned, which is given in detail below, follows such a plan, but other contrasts could be made, and worked into a suitable course.

Maps and a Globe

If the work is carried on with the aid of a large wall map of the world, or a large globe, by simply pointing out the regions on the map as they are taken, and mentioning the name of the country or continent, the teacher provides an easy introduction to the globe or to the map of the world. It is sometimes a mistake to let everything in the classroom work round lessons; it is better occasionally to let knowledge such as the above be "picked up," until the child is older and less likely to be confused by new things.

If, by the side of the wall map, the teacher has a blank map of the world, and fills up the regions as they are taken, not only will the lessons be more valuable to the class, but the teacher will also have always in front of him the reminder that it is the world that is to be covered.

As well as shading or colouring this blank map as the work progresses, the names of the peoples concerned could be printed across the region. It is better for the children at this stage to remember a region by the peoples who live in it.

Another method is to draw on the region a picture of one of the vital features of the lives of the people of that region; or to let the children bring pictures and stick them in the right places on the map of the world: e.g. Indian tent, *Eskimo kayak*, *African hut*, *Chinese coolie*, Australian sheep.

Typical Lessons

A suggested course of lessons on the above lines has already been set out on page 384.

The amount and type of material that should be used in these lessons is illustrated in the pages that follow. The young teacher may be aghast at the detail, but to the child detail is very important, and very necessary in order that he may get the right ideas. And, as has been mentioned before, the teacher has usually to do much research in travel books, *Whitaker's Almanac*, etc., if his lessons are to give truth, as well as interest.

THE ESKIMO OF THE TUNDRA COAST OF LABRADOR OR NORTHERN CANADA

These lessons might be introduced by a general chat on the globe, showing its roundness, mention of the fact that all places on the earth do not have the same climate, do not grow the same things, and therefore the people live lives very different from those of the people in our own lands. But, no matter which part of the world we study, we find the people trying to make themselves as happy and as comfortable as they can on what the country gives them. (Particularly so in the more primitive communities.)

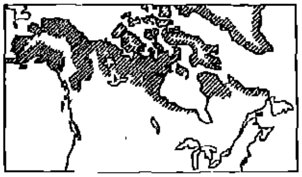


FIG. 8
The Tundra of Canada

In order to let the children realize the importance of Nature to man, ask them how their fathers and mothers would live if there were no shops. How would they obtain the things they require—with particular reference to the necessities of "Food, Clothing, and Shelter"?

Such a talk leads naturally to the study of one or two sets of people who are forced to live almost entirely on what they can obtain from Nature. Typical "food-gathering" races should be taken to illustrate this. Two races such as the Eskimo and the Pigmy should be taken, so that the class realize that such a life is not dependent on either extreme heat or extreme cold.

The Eskimo

Take an imaginary journey to the shores of Northern Canada, or the coasts of Labrador. Describe the gradual change on the journey to great cold, so that by the time the child has reached the region, he almost feels the great difference from the temperate climate of Britain.

The geographical background of this lesson will be the *Tundra scene* in its various aspects—all to be illustrated by the effects they have on the life and labours of the peoples at the two main seasons of winter and summer.

In Winter

Winter is a dreary time in the far north. The region is covered with snow, the ground is frozen hard, and not a single thing is seen growing. Nothing but white bareness, and barrenness. It is so cold that any one living there must have very thick, warm clothes, must eat plenty of food, and must have a stout shelter from the cold, from the biting winds, and the terrible snow storms. (Note—"Food, clothes, and shelter.")

But nothing grows in this frozen desert. How then can the Eskimos who live there manage to keep alive and to obtain the things they require?

The Eskimo can obtain all the things he needs from the region itself. He cannot grow things there, and he cannot live on the fruits or vegetables that grow wild. Why? Neither are there any shops in the heart of the Tundra. How does he manage to keep himself and his family alive?

He lives by *hunting* and *fishing*. In the cold winter he finds it harder to obtain food than in summer. Luckily for him there are many fish in the waters; he is a skilful fisherman, and so he is not afraid of starving. In winter all the water of the rivers is frozen, and if he wishes to fish he must make a hole in the ice. Many wild animals live in the Tundra. All of these animals have warm, thick furs. Hence hunting not only provides the Eskimo with fresh meat, but also provides him and his family with much of their clothing.

The clothing of the Eskimo when he is not in contact with the white man is entirely of skins and furs, all of which he has caught himself. The caribou, which is really a wild reindeer, is the commonest animal in many parts of the Tundra of America, but the huge polar bear, and smaller animals such as the squirrel, the marmot, and the lemming are found. In places near the sea *the seal* is the most important creature that helps to keep the Eskimo and his family alive.

Hence the children will quickly appreciate the importance of hunting and fishing to the Eskimo in terms of food and clothing.

The Eskimo's Summer

Summer time is the busiest time for the Eskimo. The animals are more easily hunted, and fishing is good. It is often very hot in Eskimo land in summer. The days are very long, and so long during one part of the summer that the sun never sets; it is then always day time, and there is no night time. I expect the mother Eskimos find it difficult to get the young Eskimos to sleep. The whole appearance of the Tundra in summer is entirely different from that of the barren winter. The sun has melted the thin covering of snow, a few inches of the frozen soil has melted, and many parts of the Tundra are covered with a thick carpet of beautiful plants and flowers. The Eskimo lives in *a tent* in summer. This tent, called a *tupic*, can be easily packed up, so that he need not stay in one place during the busy season. The tent is made of skins laid over a framework.

The important article to the Eskimo in summer is his boat. In the past this boat was made of skins stretched over a frame of wood; this *kayak* was very trustworthy, and the Eskimo could handle it in a wonderful way. Such kayaks are still used by many Eskimos in their fishing expeditions, but to-day some Eskimos are wealthy enough to use motor-boats.

The seal is one of the most valuable creatures to the Eskimo. Its flesh is eaten. Its skin provides clothes, and even shelter, while the large quantities of oil obtained from it supply heat and light as well as food.

The Winter Home

But the summer time in the Tundra does not last many weeks. The long, hot days and the luxurious plant life soon come to an end, and the Eskimo must be prepared to live through the long winter. During the heart of the winter he knows that for some days he will not see the sun at all. Life will then consist of one long night.

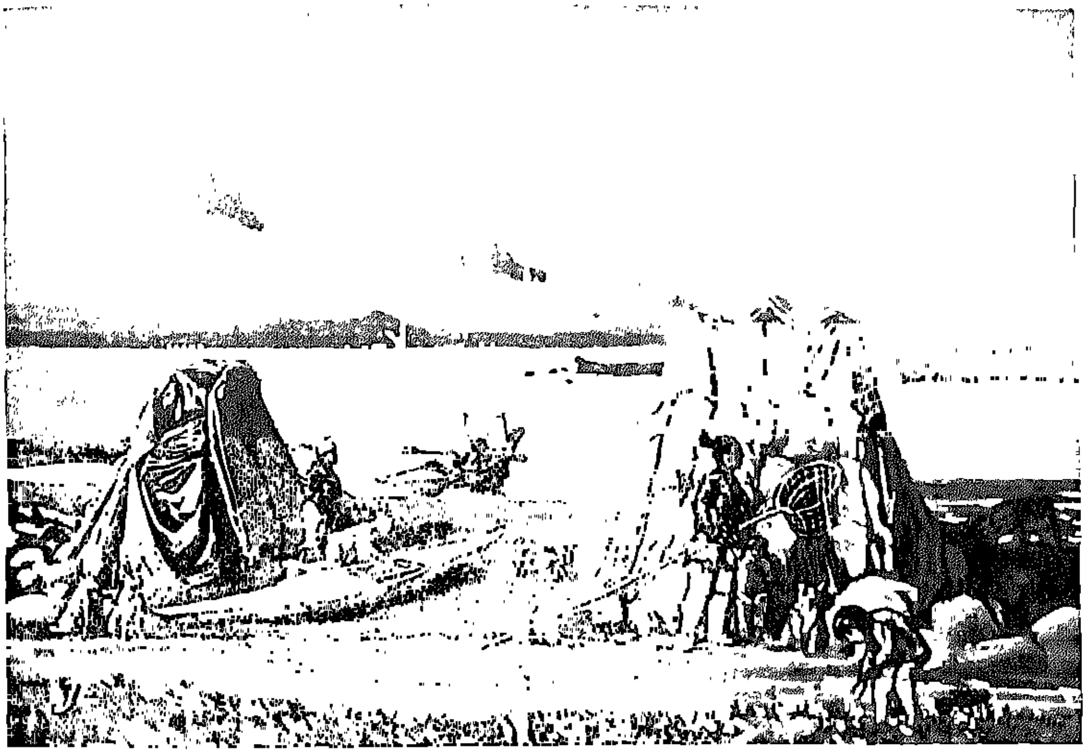


FIG. 9

An Eskimo Summer Camp

(Note boats, tents, the dogs, and the absence of trees)

The tent would be a very unsuitable home during the long, cold winter. Some Eskimos live not far from forest land; these build themselves a snug hut of wooden logs which they cover with moss. Others live near the sea, and they make their huts of driftwood, which is considered valuable in a region where wood is scarce. In other regions of the Tundra, wood cannot be obtained at all. The frame of the hut is then sometimes made of large pieces of rock. And, in the very heart of the Tundra, where even rock is difficult to obtain, the Eskimo makes his hut out of slabs of ice, made weather-proof by snow pressed into the crevices. Such a house is called an *igloo.* It seems difficult to realize that all these huts, even the igloo, are made extremely warm in winter; so warm that most Eskimos used to take off all their clothes as soon as they went inside.

(*Note.* Mr. Stephansson, the famous explorer, says that few Eskimos live in snow huts to-day, and that many of these people have never seen such a hut.)

The huts are usually warmed by lamps that burn such oils as seal oil, obtained from the animals of the chase.

Clothes

The clothes of the Eskimo should be described in detail, so that the children realize how such an item of life is made to suit the environment. The Eskimos away from civilization still use the same kind of clothes as their ancestors.

The usual dress is a shirt, a pair of fur trousers, a thick fur coat, and long water-proof boots made of seal skin. The thick fur coat has a large fur hood which is very useful for keeping the head and ears warm. These clothes have no buttons, but are fastened by leather strings.

The men, women, and children are dressed very much alike, but the woman sometimes has two hoods to her coat. In the other hood she carries her baby on her back. In this way her arms are perfectly free to do the hard work required, for most of the hard work of the hut or tent, apart from hunting and fishing, falls to the women.

After a successful hunting expedition, the animals caught are skinned, and the skins treated to make them soft. Some Eskimos think that the best way to make a skin soft is to chew it all over. This job is eagerly sought after by the children under the guidance of the mother, for a tasty meal (to the Eskimo) is obtained from the fat chewed off and eaten raw.

Travel in Winter

Winter time is considered the easy time or holiday time of the year by the Eskimo; it is when he and his family enjoy themselves as much as possible by dancing, singing, and feasting.

Winter is also the time when the Eskimo makes his longest journeys. He cannot use the kayak because the waters are frozen. He cannot use horses or donkeys because he has none, and because they could not live in such a cold country, where they would be unable to obtain the food they require (vegetable food, such as grains).

The Eskimo makes his journeys by *sledge* in winter. For this purpose he uses dogs to pull the sledge. The dog is, consequently, a very valuable animal to the Eskimo. The sledge is made of a framework of driftwood covered with skins, and is drawn by six or more dogs. These dogs are sometimes very fierce, and are occasionally like small wolves in appearance; but their main likeness to wolves is in the peculiarity that they howl rather than bark.

These dogs drag the sledge over the crisp snow. Sometimes they are in a line one behind the other; at other times they are in a line at right angles to the route of the sledge. They are not guided by reins, but by the whip, which quickly inflicts penalties on any dog that is not pulling its hardest. The dogs are fed on fish and flesh obtained on the hunting expeditions.

Weapons

Not many years ago, most of the Eskimos made their own weapons. These consisted of bows and arrows, spears, and harpoons. The Eskimos are very skilful with such weapons, which they make with great care, and prize very much. (Where do they get the iron?)

Such weapons are still used, but a rifle is more efficient, and is used when the Eskimo can afford to buy one. Also traders supply him with ready-made weapons, which are usually more useful than the ones he formerly made for himself.

The Lives and Play of the Children

In each of the regions studied in this part of the course, the lives of the children of the various peoples should receive a few moments' attention. Try to give the details of the lives of children of similar age to those in the classroom. This helps to give the human touch that is so helpful in making the peoples seem real.

It might be conveniently mentioned here that children of other lands—all over the world—are very similar in many ways. The great factor that causes seeming differences, as in most things geographical, is the environment.

The Eskimo girls have their dolls, their dolls' clothes, and their dolls' houses. The children will easily appreciate that a wooden doll will be scarce, and extra valuable to an Eskimo girl; and the dolls' houses will naturally take on the character of the houses with which the Eskimo child is familiar, i.e. a tent, hut, or igloo.

The boys will naturally be keen on games in connection with father's work—and toys that also lend themselves to such games as hunting and fishing. Note the making of toys by the father for his sons, e.g. a whip, bow and arrow, etc.

In a cold country such as the Tundra, running and chasing games are bound to be popular. (The familiar game of "he" is played all over the world.)

But in the heart of the Tundra there are no schools where the ordinary children learn to read and write. Point out that one of the important things that education should give is a preparation for life. The Eskimos receive their preparation for life from their parents. The girls learn their part of the business from their mothers with regard to housekeeping and looking after the babies, while the boys are trained by their fathers in the arts and crafts of the chase. (Point out the shortness of the childhood stage, and how they begin to work at an early age.)

Summary

The above gives in some detail the kind of lessons that the teacher of Juniors should give to his pupils. They centre round the necessities of life—food, clothing, shelter. The important fact that all these things demonstrate is that the Eskimo discussed here is a ***hunter*** (on land and water). He is a hunter because of the region in which he lives. He *must* be a hunter or he cannot live there.

The lesson should be emphasized that the Eskimo lives the life he does because of his environment, and that in such a primitive existence the region itself must provide practically all the wants of the peoples.

The next lesson will add emphasis to the above important fact by considering the life of another primitive people who are also hunters, because the environment seems to force them to this method of keeping themselves alive, but, the environment will be totally different, being in the heart of the ever-luxuriant tropical forest.

A glance at the pictures on pages 397 and 400 will demonstrate the value of pictures as a means of bringing home to the children such extreme contrasts in environment.

THE PIGMIES IN THE HEART OF THE AFRICAN TROPICAL FOREST

"In the last lesson we talked about the life and work of a people who seemed to live a very hard life in the very cold lands of the far north. We learnt that they earned their livings by being *hunters,* because the region made this practically the only method of earning a living.

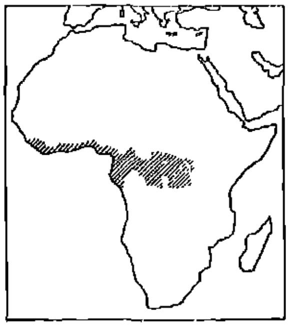


FIG. 10

Equatorial Forest Region, Africa

"Now, we are going to hear about a race that lives in a very different region. This region is one of the hottest in the world; it is in the heart of Africa, and is on the Equator." (On such lines would the teacher commence.)

Here show the map of the world, and point out the Equator (with a few details as to its meaning); then show the basin of the River Congo.

The Hot-Wet Forest of the Congo

This part of the world is always very hot in winter as well as in summer, and there is very little difference between the two seasons. The sun is always high up in the sky, and twice a year it is actually directly overhead.

This is also one of the wettest places in the world. It rains for some time nearly every day, and often the rain is so heavy that it appears as if the heavens had opened, and that an ocean was falling from the sky.

It can be imagined what it feels like to live in such a place—always very hot, and always very wet. It must be like a huge, steamy hot-house. A white man never stops sweating in this region, and it makes him feel so very tired and languid that he cannot do ordinary work.

But these conditions are very favourable to growth of all kinds. Consequently, this is a region of mighty forests. This kind of forest is known as a *hot-wet forest*, because the trees that grow there can only grow in regions where it is very hot all the year round, and where very heavy rain occurs at all seasons.

Many travellers have described this tropical forest. (Read such a description to the class, and then give the main details to be remembered.) Through the heart of this mighty forest runs one of the largest rivers in the world—the river Congo, with its thousands of waterways. The forest is so thick that land routes have to be cut through it by means of axes, hatchets, and sharp knives. If these paths are left for a season they are quickly overgrown, and the forest is filled up once again.

The main routes through the forest are the many waterways of the river Congo.

A journey down the Congo in the heart of the tropical forest is a wonderful experience. The water seems to be cutting a path for itself through a thick, and very tall, mass of vegetation. Giant trees reach high into the sky, and their overhanging branches reach well over the

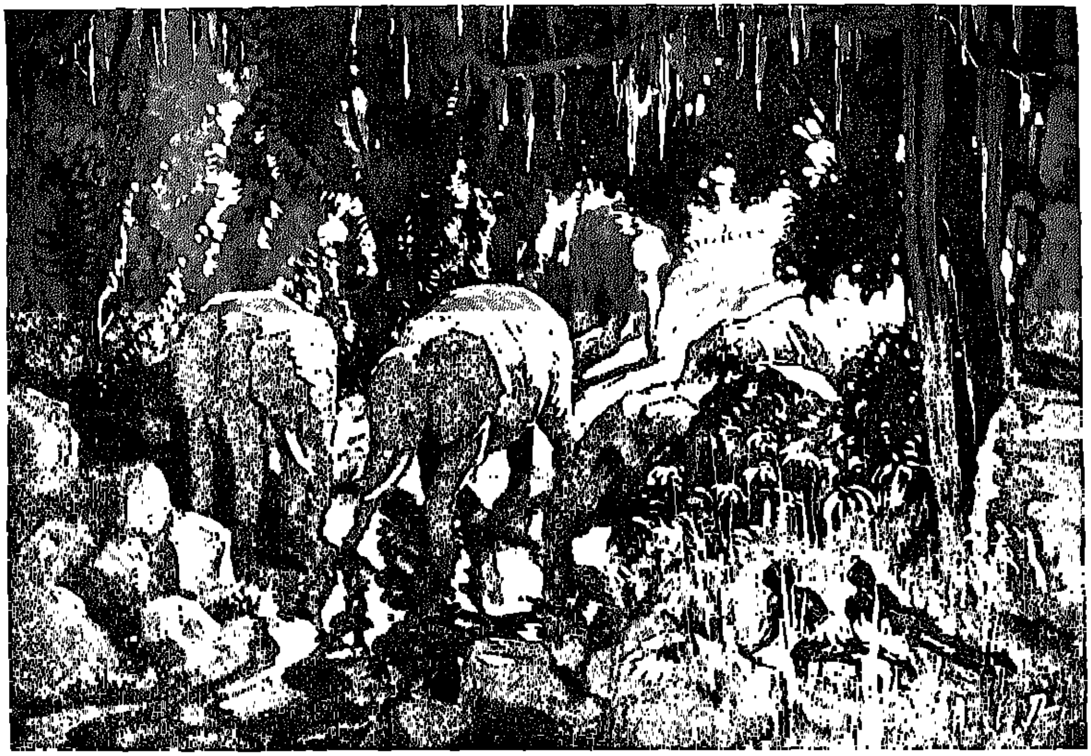


FIG. 11

Hunting Elephants on the Edge of the Tropical Forest rushing waters of the river. The great trees appear to be joined together by an enormous mass of plant growth, of vines and creepers, many of whose stems are as thick as a man's arm. Brightly coloured flowers and orchids are to be seen. From the river the forest appears like a high wall on each bank of the river.

Imagine going into the forest, by one of the narrow paths that have been cut into it. One would feel rather frightened at first, until one got used to it. It would seem so dark after the bright sun, and its shady depths would feel rather cool. Here and there a sharp ray of sunlight would just manage to pierce the gloom, and would seem as if it were a stab of fiery light. The stillness of the forest would also be striking. But, if one stood perfectly still for a long time, signs of life would be noticed. Perhaps a large snake would slither across the path into the forest depths. Innumerable insects would be seen, heard, *and felt* by the traveller.

But little animal life would be seen or heard. High up above the trees might be heard an occasional bird, for many birds build their nests in the tree tops; they do not live *in* the forest but on top of it. In the branches troops of monkeys live their chattering life—to be heard only when they feel that no strangers are present.

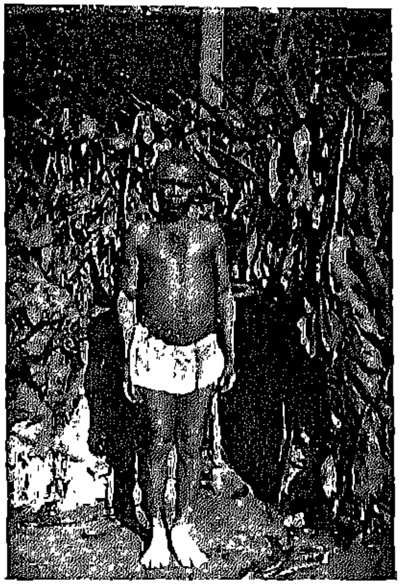
Animal life is scarce in these forests, because life is very hard for all living creatures, except insects. The plant life is too overpowering; it seems as if Nature has decided to keep out almost everything but plants and trees.

The Pigmies of the Forest

If the journey is continued into the very heart of the hot-wet forest an occasional clearing is to be seen. Often these clearings are empty, but bright eyes will see that man has been there at some time or other. At one of these clearings will be seen nine or ten shelters made of branches of trees covered over with large leaves, and mud. Such huts will be circular, and will look very untidy and dilapidated. These round huts, of branches, leaves, and mud, are very small, but they are the homes of the inhabitants of the heart of the forest.

The owners of these huts will have heard the traveller long before he ever reached their homes; when he arrives he will see no one, but will feel in an uncanny way that he is being watched. So he is; for the Pigmies are hidden, watching very carefully to make sure that no enemy has arrived.

But the traveller shows that he is a white man, and a friend. Quickly about a dozen men appear, armed with bows and arrows or with spears and sharp hunting knives. The thing that strikes the traveller first is their extreme smallness. They are extraordinarily small, but he can tell that they are full-grown men, by their faces and by their fully developed muscles. Not one of them is larger than a fair-sized British boy of 10 years of age. Their heads seem large for their small bodies, and their legs seem rather short. Soon the women and children appear from the forest, where they have been hiding until they were sure they were quite safe. The babies look very strange; they are very, very small.



By courtesy of British and Foreign Bible Society

FIG. 12. *A Pigmy Chief and his Hut*

These tiny men are the inhabitants of the heart of the tropical forest of Africa. They are called "Pigmies."

How the Pigmy Earns his Living

The pigmy is perhaps worse off in many ways than the Eskimo. The Eskimo has to work very hard in a very bitter climate, and so he has to use his brains to ensure that he keeps alive. He is forced to be a hunter, because there is no other way of earning his living in the frozen desert of the north.

The Pigmy is forced to live a similar life, although he lives in a vastly different region, where things grow easily. He also is a *hunter*, and *a food gatherer*. He never grows anything; perhaps he has not the intelligence or patience necessary; or perhaps he knows that the forest would soon choke any land that he took the trouble to clear.

Perhaps, also, he prefers to live by hunting and by gathering the fruits of the forest. The climate is so enervating that he will not do unnecessary hard work.

His wife and children gather any food that is to be found in the forest—berries and other wild fruits, as well as such things as wild potatoes, vegetables, or roots that are dug out of the earth.

But the male Pigmy prefers to hunt or to fish. That is the man's job in the tropical forest.

Weapons

His weapons are bows and arrows, often poisoned, and possibly a spear and a sharp hunting knife. Some tribes use a blow-pipe, through which they blow poisoned darts (thorns) at their prey.

After a successful hunt, the animal is skinned, and there is a feast. The women cook the meat, mixed with the forest vegetable products, in a pot outside the small huts.

Salt is much prized by these people, as it is very scarce in the heart of the forest. Our traveller will have made them a present of a small bag, if he wished to please them.

After the feast, there is usually a dance, in which the whole community of men, women, and children join.

Nomads of the Forest

As these people are hunters and food-gatherers they cannot stay in one place always. When the game or food in one area becomes scarce, they move to another place, and, of course, are forced to leave their homes behind them.

The Eskimo also is *a nomad* to a great extent, but takes his summer home with him. Hence he tries to make his home as snug as possible. But the Pigmy does not do this. He does not seem to mind discomfort, and does not appear to wish to give himself bodily comforts. For instance, he has no furniture, he wears hardly any clothes, and does not make himself rugs and blankets. His only interest appears to be his weapons, which he looks after very carefully.

All the above things are due mainly to the climate of the region. The Pigmy does not want clothes, nor rugs and such things; the climate is too hot. He has no domesticated animals (unlike the Eskimo), so the easiest thing for him to do in the circumstances is not to take his home with him, but to leave it, and make another one at the next stopping place—especially as one can be so easily made in such a region. This also explains why his home seems so uncared for.

The women take care of the cooking utensils, and take them with them whenever they move.

The Pigmy has no ordinary arts or crafts. He has not a friendly nature, and is a very bitter and cruel enemy.

His Negro Neighbours

On the edge of the great forest, where the forest thins out a little, lives a very different race. These are negroes—black men—full-sized men, who have cleared the edge of the forest in places, and who grow crops and rear cattle.

The Pigmies visit them occasionally, and trade with them for hunting weapons, and cooking utensils. In return they give skins and other forest products. The negroes do not like the Pigmies.

(*Note.* The Pigmies are quite an unimportant race, and this should be pointed out to the children. The above lesson is given mainly for purposes of comparing the hot, wet environment of the forest dwellers with the extremely cold, barren environment of the Eskimo in so far as both environments produce the *hunter* type.)

TRAPPERS AND FUR TRADERS OF CANADA

We have already used the "contrast" method in describing the life of the Eskimo in summer and winter. But, as well as such seasonal contrasts, in any one region, there are also the sharp contrasts of consecutive lessons to be considered. For example, the life of the Pigmy in the hot-wet forest was described immediately after the life of the Eskimo in the very cold Tundra.

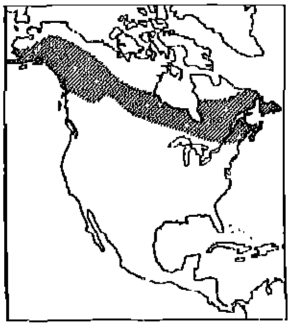


FIG. 13
Coniferous Forests of Canada

This method could be continued by taking, next, another region in great contrast to the hot-wet forest, such as the Cold Forests in Canada. These two examples should show the child the differences in life and conditions between two very different types of forest regions—the hot-wet forest type of the Equator, and the cold coniferous forests of north temperate regions.

Introduction

Canada is shown on a map of the world, its position in the northern hemisphere is studied, and the consequent climate either ascertained by, or given to, the class (in a very broad way).

Reference could then immediately be made to the hot-wet forest studied in the previous lesson, and its position on the map of the world again pointed out. Mention could be made at this point that other regions of the world have a climate and vegetation like that of the Congo region, and the main similar region (the Amazon) should be pointed out, and marked on the blank map of the world.

There are other kinds of forests in the world. Some are very like those to be found in our country, where the trees are broad-leaved like the oak, ash, elm, and sycamore. These forests occur in places that are neither very hot in summer, nor very cold in winter, viz. in *Temperate Lands* such as our own. (The teacher should here point out the main regions having these broad-leaved forests.)

Still farther north another kind of forest occurs just south of the Tundra. There the winters are very cold, snow falls frequently, and the rivers and the ground are frozen. The only trees that are able to live in such a climate are trees that will not have to give up too much moisture by means of their leaves. Nature has given these trees a special kind of leaf, that which stays on the tree all the year round but cannot give up much moisture at any time. Such trees are those belonging to the pine and fir families. The leaves of these trees are curled up into a spine or needle shape. The fruits of these trees are cones and so these cold forests of the north are often given the name of Coniferous Forests.

Coniferous Forests stretch right across the world in the northern hemisphere—in Canada, Northern Europe, and Northern Asia. (Mark these on the blank map of the world.) The lives of the peoples in all these areas are very similar, because of the climate and the consequent type of forests. We are now going to study the life of some of the people who live in the heart of the Canadian forests. What kind of work would the inhabitants of such forests be able to do? Of course, they could be woodsmen, who cut down the trees, the lumbermen. In a future lesson we shall learn something about the lumber industry, which occurs mainly in the southern region of the Canadian forests.

In this lesson we are going to learn about the people who earn their livings not through the timber of the forests, but by means of the animals that live there. These people live mainly in the northern regions of this great forest region.

Animals that Live in the Coniferous Forests

Although these forests are very cold in winter, and are not very favourable for man to live in, yet many wild animals make their homes there.

How will these animals be able to stand the very cold winters? By means of the thick furs with which Nature has provided them.

The animals of the Coniferous Forests all have thick, warm furs, and these furs are very valuable to-day. Ladies in all countries are very pleased, and proud, to wear the furs of these animals, and are willing to give large sums of money for them. Such animals are the fox, sable, mink, skunk, squirrel. Hence, in certain parts of these forests men earn their livings mainly as *hunters* or *trappers* of these furry animals.

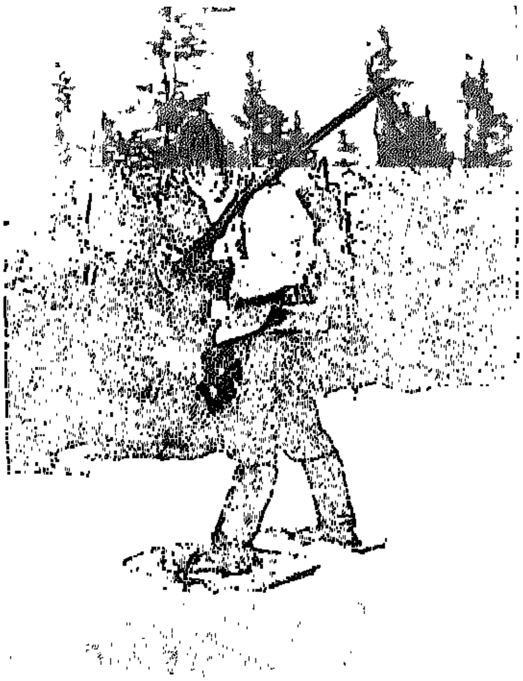

W. F. Taylor

FIG. 14

A Labrador Trapper

(Note clothes, snow-shoes, and traps on his back)

A Trapper's Life

The hunter of the Tundra and the hunter of the hot-wet forest hunted animals mainly for the sake of food, although the skins and furs are very useful to the Eskimo. However, the men we are going to talk about to-day do not hunt and trap the animals for food, but for the sake of the valuable furs. They do not even wish to use the furs for themselves or for their wives and children. They trap the animals of the forest because they can receive good sums of money from the fur-traders.

The most important time of the year to the trapper is *winter*, when the animals of the forest have the best furs. This time of the year is also most convenient for the trapper in another way. During the summer, the land of the forests of Canada has many waterways and swamps, so that travel, except by canoe, is very difficult.

But in winter time the streams, swamps, and lakes are frozen hard, and travel on them is thus easy—with the aid of *sledges, and dogs* to pull them. The trapper can also move very quickly over the thick snow by means of his long *snow-shoes*.

Just before the winter season sets in, the trapper, who may be either a Red Indian or a white man, prepares very carefully for his winter's work. He has a hut in the heart of the forest, and he gets the necessary stores ready. He has to be very careful that he forgets nothing, for there are no villages or shops for many miles; and, as he is usually snowed up for the whole winter, he could not make very long journeys. Hence he takes his stores with him; stores of flour, tinned meat, bacon, plenty of tea, and any other foods that he can afford and likes. Nor does he forget his tobacco.

His hut is called a *shack;* it is built of rough logs hewn from the forest, and is made as draught-proof as possible. In the centre of the shack is an iron stove with a long pipe that passes through the roof. He always has a large pile of small logs outside the door, for warmth is very important to the trapper.

The furniture is made for use and not for looks. You would think it very rough, and very scanty—just a table, a stool, a large shelf, and a bunk to sleep on. But the trapper always has plenty of warm blankets and a warm sleeping bag.

The Trapper's Work

Each trapper uses a certain part of the forest. In this region he sets his traps. Naturally his round cannot be too long, but sometimes his trap line is more than 30 miles long. He sets his traps about three-quarters of a mile apart. As his trap line is so long, it can easily be understood that he cannot get home every night—even with the aid of his dog sledge. In that case he is sometimes forced to sleep in the forest; but he knows how to build himself a fairly cosy shelter, firewood is easily obtained, and he is well provided with warm blankets.

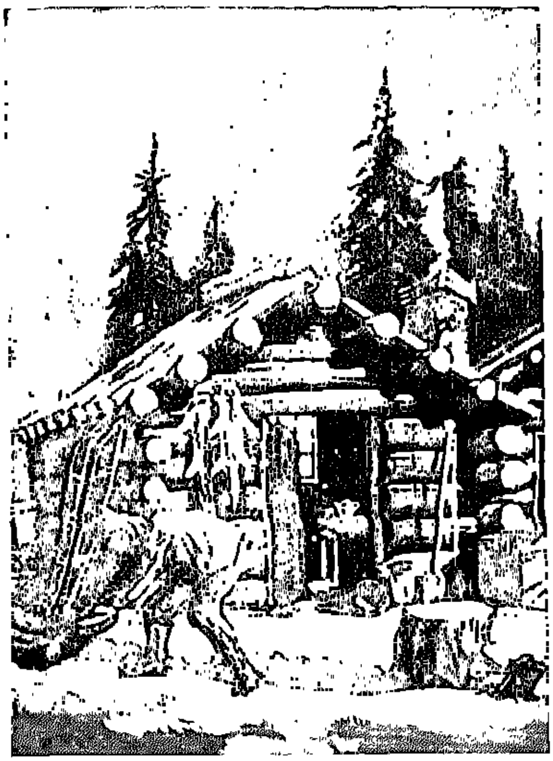


Fig. 15
A Trapper's Shack

On his round he takes out the animals that have been caught in his traps, and carefully resets each trap. He rapidly skins the animals, and packs the valuable furs on to his sledge. On his arrival at the shack, he prepares the skins so that they will not spoil. They are cleaned, dried, and placed on the pile that gradually gets larger as the winter progresses.

Off to the Trading Post of the Hudson's Bay Company

The winter months are at last over, and he has had a lucky season, for there is a huge pile of furs, some very valuable indeed.

As the weather has become so warm that the waterways are no longer frozen, he prepares his light canoe, made of birch bark, and loads it with the season's catch, food and drink, and his belongings. The trading station is a long distance away from his winter quarters, and can be reached only by water, but he knows the way well. After a day or two's journey, he arrives at the trading station of the great fur trading company, known as the *Hudson's Bay Company*.

At this time of the year the trading station is very busy, receiving the precious furs and skins, assessing their value, and paying the trappers in money or goods. The trading station must also be the place where the trappers can get their various requirements of food, clothing, ammunition, traps, etc.

From the trading station the valuable *pelts* are sent to the nearest railway, often many miles away; the railway takes them to the larger towns, such as Montreal, Quebec, or Winnipeg, and thence to London, where three times a year fur buyers from all over the world attend the great raw fur auctions held in the Fur Trade Saleroom of the Hudson's Bay Company in Garlick Hill, E.C.4.

(The teacher should refer here to the fur coats seen by the children, and should point out that many of the cheaper furs worn by ladies to-day are made of rabbit skin, and do not come from the Cold Forests of Canada.)

Pictures

Show pictures of typical scenes in the Coniferous Forests in winter; the trapper's shack, a trapper at work, a trading station, and pictures of some of the fur-bearing animals that are killed by men to provide warmth or decoration.

Let the children find on the map Hudson Bay, Winnipeg, Montreal, and New York. Let them trace the journey made by the pelts from a place in the forest region near Hudson Bay to one of these towns, and then trace the route from there to Britain, on the P.J.F. chart.

LIFE IN A TYPICAL VILLAGE IN INDIA

So far the children have had lessons on people who live by hunting. They have seen this method of obtaining a living from Nature in the very cold lands of the Tundra, in the very hot lands of the tropical forest, and in the cold forest lands of Canada.

As a great contrast to all of these types, a glance at the general conditions of rural India and Pakistan (and most of the sub-continent can be termed rural) will be found useful and enlightening.

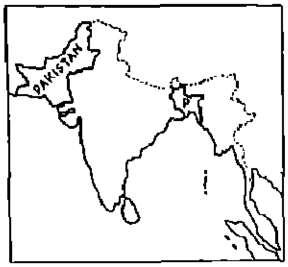


FIG. 16

Introduction

Mention the above things to the class, by way of revision, and then point out India and Pakistan on the map of the world (Pakistan is shaded in the sketch map above).

India is one of the most thickly populated countries in the world (mention China). Nearly eight times as many people live there as in Britain. It is many times larger than our own country.

Most of the millions of Hindus in India are farmers. They are not hunters, and therefore not nomads, who must be continually changing their abode. Farmers stay in one place and grow things; they have a permanent abode.

The Farmers of India

Although there are many large towns in India, such as Calcutta, Bombay, and Madras most of the people have something to do with the growing of crops. Most of them grow *food crops*, but others grow such things as cotton or jute. We are going to glance at the Indian farmers who grow food. (See THE PRACTICAL JUNIOR TEACHER chart "Rice in India.")

Now India is a very hot country, both in summer and in winter. In some regions, away from the large towns, men, women, and children wear very little clothes because of the climate. What clothes are worn by ordinary people are made of cotton (cheap and cool).

Rice is the chief food of many of the people of India. This has to be grown in lands that are very wet and receive heavy rain. (Describe, briefly, the methods of rice growing, to be expanded when the lesson on Chinese farmers is given.) The people of India are poor, and they find it difficult to obtain food other than rice, which gives the largest crop; also they think it wicked to kill the "holy" cow. Sometimes they are unable to get even rice. Let us see why.

India is a country that does not receive rain all the year round as our land does. The rain comes only in the summer time in India, and then it comes down very heavily indeed. But, if for any reason the rain is insufficient, much misery is caused to the poor Indian farmers, for their food crop of rice is not a good one, and, consequently, they are in danger of starvation. (Describe the plans made by the government to help famine districts.)

The farms in India are usually very small, and many farmers grow their crops as food for themselves—not to sell them. If there is a bad season, they find it very difficult to live, and in the past many have starved to death.

As their lives depend on the crops, they are usually hard-working people—when working on their own land.

A familiar sight on an Indian farm is the *buffalo* or *ox* with huge horns. Just as the horse drags the plough and is used as a beast of burden in our land, so the buffalo or the ox is used in India. The buffalo is a very useful animal to the rice-growers, for it is so strong that it can easily drag the plough through the thick mud of the rice fields; its great delight is to be allowed to wallow in the water of a pond or river.

Most of the carts of India are drawn by oxen. They do not go very fast.

The homes of the poorer people of India would seem bare places to the children of Britain. They are rude houses made of a framework of bamboos covered with sun-dried mud, and thatched with thick grass.

The schools are still too few, however, and many of the children work on the farm when they are quite young. The more people there are to work on the land the better pleased are the father and mother, for this means that more food can be grown.

The different climate and tradition, and the comparatively small amount of industrialization, inevitably give rise to conditions of life quite different from ours in Great Britain. Irrigation, better farming, healthier conditions of living, and more education are, however, developing. Under the former British rule much was done that is now being furthered by the Indian Government.

The Indian Village

The Indian village is a very interesting place. There are all kinds of what seem to our eyes queer-looking houses and shops.

In *the bazaar* all kinds of things are sold. Everything is very different from a shopping scene in this country. Perhaps there will be a man working in brass, doing some very clever work on an article that would be worth a lot of money in England. Another will be carving tiny models of elephants or tigers in ivory; it seems impossible that he can make such delicate things.

Water is always very valuable in India, and a common sight in any Indian village is the water-seller with his skins that hold the precious liquid.

The well is an important place to the villagers. "At the well mild-eyed bullocks draw a rope down an incline; a huge leather bucket comes up, and is emptied into the stone cisterns and conduits about the base." (Refer to the importance of irrigation in India, and the conservation of the water supply, by means of dams, canals, or "tanks.")

At the entrance of some villages will be seen the primitive *sugar mill*, in which thick sugar canes, which grow only in hot countries, are placed by a young boy, and crushed by the heavy rollers. The mill is turned by two oxen, which go round and round all day, and are sometimes blindfolded to prevent them becoming giddy. The juice is later boiled, and allowed to harden into cakes; these are sold as the usual sugar for the Indian peasant.

The Indian children are very fond of the sweets made from this sugar.

(*Note.* As our children must not receive the idea that everything in connection with the Hindus is covered by the study of the peasant, the teacher should add descriptions of life in the large cities, or introduce into the village life above a wealthy landowner. The teacher's general reading will often give details to be used in describing everyday scenes in other lands, some children will be able to contribute the experiences of adult relatives who have been abroad, and pictures and articles from current journals will be collected to keep the lessons in touch with recent developments.)

The People

Care should be taken that the children do not think that the people of India are negroid people. They should understand that the people of India are made up of a totally different race or races from the African. Note the typical features, often very similar to the European white man's, with none of the characteristics of the negro nose, mouth, or hair.

THE KIRGHIZ HORSEMEN OF THE STEPPES OF ASIA

Asia also has an enormous forest belt similar to the one in Canada, and also just south of the Tundra. This belt stretches from Europe into Asia for hundreds of miles. At the southern limit of this belt of coniferous forest the trees gradually thin out until at last only grass is to be seen. This is due to the gradual diminution of rainfall, and because the scanty rain falls mainly in summer. Trees are unable to grow in regions that do not get a reasonable amount of rain during most seasons of the year.

Hence, south of the forest belt, vast grasslands cover hundreds of square miles. Not a tree is to be seen anywhere. The grass, when fresh, looks much like the grasslands in our own country.

The Steppes

These grasslands of temperate latitudes are known as the "steppes." They stretch from the heart of Asia into Europe north of the Black Sea and south of the European belt of coniferous forest. (Point them out on the map.)

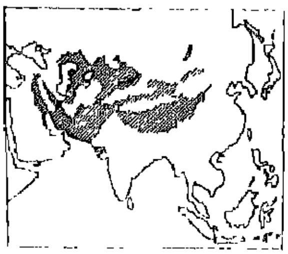


FIG. 17
The Steppes and Semi-desert Lands of Asia

The regions of the steppe that receive better rainfall are very fertile, and form the famous wheat lands of south Russia.

But most of the steppe is unsuitable for agriculture unless irrigation is practised.

Suitability of the Steppes for Pasture

The majority of peoples who live in such vast grasslands are at first nomads, who wander from place to place, earning their means of livelihood in the way most suited to the region. But they are not "hunters" or "food-gatherers" as the Eskimo or the Pigmy. What can they do to earn their livings in such a region, where nothing seems to exist except grass?

Here the children could be referred to the grasslands of our own lands. What happens on the grasslands of our own country—on the rolling *downs* of S.E. England or the grassy slopes of the Pennines? The children might be able to say from their own experience that the few people living in such regions—in England, Wales, or Scotland—are usually shepherds or herdsmen, but that they are not nomads.

The Kirghiz Horsemen

The Soviet Government is forming settlements on the steppe, introducing collective farms; but these involve vast schemes for irrigation and transport. The nomadic life is introduced as typical of the natural environment.

On the vast steppes of the Old World live people whose tradition is to look after huge herds of domesticated animals: camels, horses, sheep, goats, and cattle.

One of these races is the Kirghiz. Let us pay them an imaginary visit in pre-Revolution days, when they were a typically nomadic people. The men have to attend to vast herds. Usually the only means of travel in the steppes is by camel or horse. The horse is the much speedier animal, and is used when the Kirghiz wishes to round up his herds or when he wishes to travel quickly. He is a wonderful rider, and has been used to riding on horseback—often bareback—since he was very young. The Kirghiz are possibly the best horsemen in the world, and can make their horses do the most wonderful things. Horse and rider understand each other, and work so well together that they seem like one creature.

The Steppe in Winter

In winter the steppe is a very cold and bleak region. Terrific storms occur, and snow covers the ground. The herdsmen of the steppes make their cattle as comfortable as they can, by finding a valley protected from the bad storms, where a certain amount of pasture is available.

They have stored up some food, such as hay, for them. The ordinary pastures do not give much food in winter for various reasons: the snow is thick in some parts; the grass is not in good condition after the hot, dry summer; and there is a great scarcity of water.

Camels and Sheep

The camel could now be concentrated upon for a few moments to illustrate the drought-like conditions in certain parts of the steppe.

The camel is an animal that is peculiarly suited to the dryer conditions of the steppe. The camels of Asia are different from those of the Sahara desert in Africa. They are provided with a *double hump*. One can tell the state of the camel by its hump. If it has had plenty of suitable food, then its hump is normal; but if it has had a lean time owing to a scarcity of good pasture, its hump dwindles in size. It seems as if the camel in some wonderful way is living on its own hump. The camel can also go without water for a longer time than other animals.

The *sheep* of the steppes of Asia also have a peculiar means of storing food similar to the camel's hump. But, instead of a hump, they have a piece of fat under the tail. For this reason they are called *fat-tailed* sheep. The fat under the tail dwindles as the sheep receives less food, just as the camel's hump dwindles.

The Steppe in Spring

The early days of spring are eagerly looked for by the steppe dwellers. The days become warmer, and the snow begins to melt. Soon the snow has entirely disappeared, and then a most wonderful sight appears on the steppe. The melting snow has watered the earth that was left so dry the previous summer. Almost immediately, it seems, the steppe becomes a mass of fresh, green grass and millions of flowers of all kinds. The seeds of these plants have been lying there ever since they ripened during the last summer; the parent plants died.

What a feast there is at this time of the year for the herds of animals! The camel's hump soon gets plump again, as does also the fat tail of the sheep. The animals have a healthier appearance, and the hair of the camels and goats, the wool of the sheep, and the coats of the horses and cattle, are soon in excellent condition.

The Steppe in Summer

As the spring progresses the steppe becomes more and more splendid. The scanty summer rains also add to the general healthiness of plant and animal life. But, when the summer rains are over, the Kirghiz knows what to expect, for it always happens.

The gorgeous flowers die, and the green grass becomes dried and dead looking. As the sun gets higher and higher in the sky, it gets hotter and hotter. The grass becomes shrivelled, and in most places looks blackened and burnt. A strong wind blows dust everywhere, and makes life very uncomfortable for both man and beast. As the lowlands get dryer and dryer the fodder becomes used up, so that if the herdsmen insisted on staying in the same place their cattle would starve. Hence the Kirghiz head-man decides to move once again. He knows that the *higher lands* are less likely to be as dry as where he is, so he, his sons and relatives, his wife and children, get ready to move as soon as possible.

The men receive orders to round up the cattle, and the steppe is then a place where clever riders can be seen, hard at work, driving in the cattle, often from long distances, and staying in the saddle all the long day.

Homes

As the herdsmen we are visiting are nomads, their homes cannot be permanent. But they are more permanent than either the summer tent of the Eskimo or the miserable shelter of boughs of the Pigmy. The homes of the Kirghiz and such steppe dwellers are round, strong tents with semi-circular roofs. They are made of strong frameworks of springy timber, and covered with skins or felt. These circular erections are called *yurts*. They are very cosy inside, and some have good furniture, and beautiful rugs made from camel hair, which is very soft and silky.

The Camp Moves to Fresh Pastures

When it is time to move, because of the scarcity of food for the flocks and herds, the cattle are rounded up by the daring horsemen.

While this is being done, the yurts are taken down. These and all the belongings are packed on to the camels and horses, and with the women and youngest children seated right on the very top of the piles—off the whole encampment goes. Perhaps this is the first time the youngest son of the chief is allowed to ride all the way on his own pony.

When they arrive at new pastures, a *well* is first sought. This is cleaned out, to make sure that water is obtainable, and that it is good for drinking purposes. If it is all right, and the spot is suitable in other ways, the chief decides to camp.

The yurts and belongings are quickly unpacked; every one helps in erecting them, and before night has arrived the whole camp is tired, but very happy. Their homes are ready; a good meal has been prepared by the women and girls; there is a good fire as the nights are very chilly, even in summer—and the animals have good pasture.

Food

Our Kirghiz steppe dweller is a nomad, he does no cultivation. He looks down on people who stay in one place and grow things.

Hence his food must consist mainly of what his flocks and herds can give him. The mother animals are regularly milked each day—camels, horses, sheep, cattle, and goats—if they have any milk to give. As well as making a very nourishing drink, the milk is used for making butter and cheese, just as cow's milk is used in our own lands. Meat, when it is required, is easily obtained by killing one of the animals.

Such things as flour, and particularly tea and sugar, are obtained from the *caravans of traders* that regularly cross the vast steppe lands, from China. These caravans are of camels, for these are hardy animals; the caravans from China have to cross hot lowlands, high mountains, cold deserts, as well as the drier parts of the steppe itself, where water and pasture are scarce. The caravan is eagerly welcomed by the camp of steppe dwellers. How they talk to the leaders of the caravan, and what a good feast they give them!

They do much trade with these men, and buy all kinds of things that they are unable to get in the grasslands. In exchange they give the products of the steppe—mainly animal products, such as leather goods, skins, and rugs and blankets made from the hair and wool of the camel and sheep.

The tea brought by the caravan is a very important purchase. It is very different from the tea that is bought in the shops of Europe. It is known as "*brick tea*," because it is in the form of flat bricks, and as hard as bricks! These tea bricks are made in China, especially for the steppe dwellers; they are made from tea dust.

Clothes

The Kirghiz man and woman dress very much alike. Their clothes are usually very thick, for the nights, in summer as well as in winter, are very cold, while the winters are always very severe.

Skins, leather, furs, and wool of all kinds are used for their clothes. (Show a picture of the typical dress of a man and a woman.) The wool is obtained from the camel and sheep, and the women spin and weave these materials into excellent cloth. The skins are treated so that wonderfully soft leather is obtained.

Some of the women have very ornate jewellery, of which they are very proud.

It can be understood from the above that the Kirghiz are practically self-sufficing. They love their work, and the loneliness of the grassy steppes; they would hate to live in towns.

The teacher should comment generally on changes introduced by the Soviet Government, and watch the press for news of the daily life of the Kirghiz. Some changes, as in system of government, transport, and trading, may come comparatively quickly, but traditional skills and clothing are very likely to survive indefinitely. All over the world the nomadic way of life is largely giving way to the advance of agriculture and the future of the Kirghiz will be very different from the past; history gives many examples of peoples who have had such fundamental changes in their way of life. The future will bring them modern facilities; but our children should understand the nomad's life as one important means of getting a living from a particular kind of environment. They should also understand that in nomadic life the children, though they do not go to school, learn much from parents and relatives: the boys gain knowledge of the breeding and care of flocks and herds and the skills of hunting; the girls learn the arts of home-making, of cooking, butter and cheese making, spinning and weaving, and so on. The children of the nomadic Khirgiz were well cared for, and though it was in many ways a hard life the people were highly skilled and had their pleasures. It will be interesting to see how much of the old tradition is brought into the new. It should be remembered that the new way of life will be developing in a new environment, for irrigation and large-scale agriculture must change the grasslands themselves.

THE RICE GROWERS OF THE CHINESE RIVER VALLEYS

This lesson will be a sharp contrast to the life of the nomad dwellers of the Steppe lands of Central Asia. The teacher should try to bring out the essential reasons for these differences, mainly in terms of the physical environment, and especially with reference to climatic conditions and an ample water supply. *The Yang-Tse-Kiang* could be taken as the typical river valley. The very heavy population should be emphasized, and the number of large towns. Yet the people are mainly agricultural, and rice is their main crop and food.

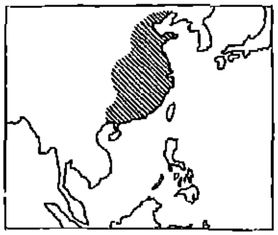


FIG. 18. *Rice-Growing Areas, China*

For other particulars the teacher can draw on pages 139–40, which deal in detail with rice growing. (THE PRACTICAL JUNIOR TEACHER chart "Rice in India" shows somewhat similar methods.)

The Chinese

The lives of these wonderfully patient and hardworking people should be taken in some detail, so that the young child may begin to *appreciate the worth of a race whose civilization* is older than his own, although the skin is of a different colour.

Although the life of the ordinary peasant will receive most attention, the teacher should also give some account of the life of, say, a wealthy merchant, who lives in a beautiful house, and receives all the luxuries that ancient and modern civilization can give him.

Houses

The material at hand is used in the country districts, viz. stone, mud, straw. Note that, as the forests have been cut down for centuries except in the very wild parts, timber is very scarce.

Describe the inside of the house—very primitive for the *coolie*, but more homely for the prosperous peasant. Note the contrast between the home of the typical Chinese farm worker and that of the steppe dweller. One is more or less permanent, the other is not.

Usually there is no fireplace in the Chinese home: coal is very dear, and, as we have mentioned, wood is scarce. But, in the cooler regions of the north, a stove is used, in which all the rubbish is burnt. Note the custom of putting on more and more clothes as the weather gets colder, and of padding these with cotton-wool.

Clothing

The usual clothing is made of cotton. Domesticated animals are scarce, because all the land is taken up by the crops because of the heavy population. Cotton is a fairly common crop in the warmer regions of China. Point out the rise of modern industry in the large towns, so that Shanghai has many cotton mills, where the raw cotton is turned into cotton cloth, in much the same way as it is in our own lands.

Note silk clothes for the more wealthy people. Why? But note particularly the coolies' peculiar clothes and hats made from the rice straw.

Food

Mainly rice, often mixed with fish. Tea is the favourite drink. This is because tea is also a natural product of the warmer regions of China—grown on the dryer slopes of the hillsides. But the Chinese do not drink it with sugar and milk, and we would think it very weak, being a very pale amber liquid.

In such a way as the above the teacher will give the details of the lives of the majority of the Chinese people, so that a fairly complete picture (for a child) is the result.

But, as the main topic is the life of the rice-grower of the lower parts of the river valleys, this should receive more attention. The child, if he realizes nothing else about the Chinese, should appreciate the careful work, the heavy toil, and the extreme economy of these land workers. Nothing is wasted.

Implements are similar to those used hundreds of years ago. The wooden plough, and harvesting by hand are still the usual methods and, strange though it may seem, they are the best methods in the circumstances. The water buffalo is the beast of burden and the drawer of the plough and the primitive cart.

The Chinese farmer is a gardener rather than a farmer, in so far as most of his work is of the hand-spade type.

The Character of the Chinese

They are very conservative. For centuries they have thought the Chinese the greatest people on earth. They wished to keep to themselves, and hated all foreigners. They refused to learn new methods. Only during the last sixty years or so have they begun to appreciate the white man's methods. To-day they are learning fast, and have a great future. China has vast stores of untouched minerals, including huge quantities of coal.

Let the class notice the position of China on the globe, its distance from Britain and Europe, the shortest way of getting there, and its distance from America—across the great Pacific Ocean. Notice also its important neighbours—U.S.S.R. and Japan.

In this way the child is gradually brought into contact with the important regions of the earth—the teacher aiming all the time at getting the child to see the world as a whole.

Any future lessons on China will refer to the above details, and will amplify them for the purpose at hand, thus adding to the child's conception of a very wonderful land and a very wonderful people.

(*Note.* The Chinese do not wear pigtails to-day, and the girls' feet are no longer tortured by binding.)

THE NETHERLANDS—THE HOME OF THE DUTCH

So far the children have been introduced only to lands very far away, and to peoples who are very "foreign" to their own experience. It would be a good plan for the teacher of Juniors occasionally to take a region of European peoples, and so keep the children in touch with western civilization as illustrated in that continent.

For example, after the lesson on Chinese husbandry, the children could be introduced to the just as hardworking Dutch people, who also live and work on the lowlands. Just as the teacher may possibly have illustrated the lesson on the rice-growers of the river valleys by mentioning the fights against the floods of the valley of the Hoang-ho, so he might continue the idea of man fighting the forces of Nature, by a talk on the war against the inroads of the sea, and the use made by the Dutch of the natural lowness of their country.

The Dykes of Holland

The position of Holland with regard to our own land should be pointed out on the map of the world, and it should be emphasized that the people of this land live lives very similar to our own. These people are called the Dutch.

Their land is a very low land, so low that, in many parts it is below the level of the sea that borders it on the north and west. Hence, the Dutch people have had to build a great barrier along the sea coast, to prevent the sea from flooding their land. These barriers against the sea are known as *dykes*, and the Dutch have to be very careful to ensure that not even a small breach occurs in this wall against the sea. (To give added interest, the teacher should relate the story of the brave boy who blocked up a hole in the dyke by his arm until aid arrived, thus saving the lives and property of many people.)

The Zuyder Zee could be pointed out on the map, to show what the sea could do if allowed to work its will.

Land Reclamation of the Zuyder Zee

The above mention of the Zuyder Zee leads up naturally to the present work of reclamation of flooded areas of this region, and the importance of this work to the peoples of a small country, where every extra acre is of great value.

Windmills and Canals

But as well as the miles of dykes built against the sea, the Dutch are threatened with destructive floods from the many rivers. Holland is so low that much of the land would be water-logged if considerable pains were not taken to get rid of the surplus water. This is done by means of pumps. These pumps are often worked by means of windmills, which are a characteristic of Dutch scenery. The wind blows the arms of the mill round and round, and this movement works the pumping machinery attached to it.

The water pumped from the fields must be made to go somewhere. Hence, many canals have been cut to allow the water to drain off into proper channels. These canals have been built to join the many natural waterways of the rivers, such as those of the river Rhine.

(Note the many mouths of the Rhine. These also have to be dyked, for the bed of the river tends to become higher than the land on either side.)

These canals are utilized to their utmost as a useful means of transport. In summer, boats and barges of all kinds and sizes sail or are moved along them; they act as roads. In winter the canals are frozen over, and are used as roads by sleighs drawn by dogs or horses, and by skaters on foot.

At this point the teacher could give an account of the fun of the children of Holland in summer and winter, making the canals and waterways the central theme.

Clothing and Houses

These geographical matters are best illustrated by suitable pictures, the details of which should be pointed out. Note that the more picturesque types of clothes of the Dutch people of picture books are not so common to day as formerly, and are hardly ever seen in the larger towns. Clogs, however, are often worn. Let the children reason out why clogs are of greater use in a land that is wet. Is wood cheaper or dearer than leather?

Dutch Farmers

The life of the Dutch might be taken for the purpose of the young children as being represented by the farming community—especially in terms of the rearing of cattle, and the consequent dairy produce.

Note the manufacture of Dutch cheeses, and show pictures of a cheese market, and the transport of the cheeses.

A mention of the bulb-growing industry should also be made, especially if the children happen to be growing bulbs in school—for many of these are likely to have come from Holland.

THE MOUNTAIN DWELLERS OF SWITZERLAND

A good contrast to the life of the Dutch in the Netherlands is to take next the life of the people of a mountainous country, such as Switzerland.

The connection as well as the contrast between the two countries could be brought about very naturally by taking an imaginary trip up the Rhine from the North Sea to the Alps. The great point to make, then, is the work of running water as illustrated by the rushing torrents of the Upper Rhine, and the dropping of the resultant debris along the bed of the Rhine, so that the children appreciate a part of the truth that Holland might be called "The gift of the Alps of Switzerland."

So much for the introduction of the lesson.

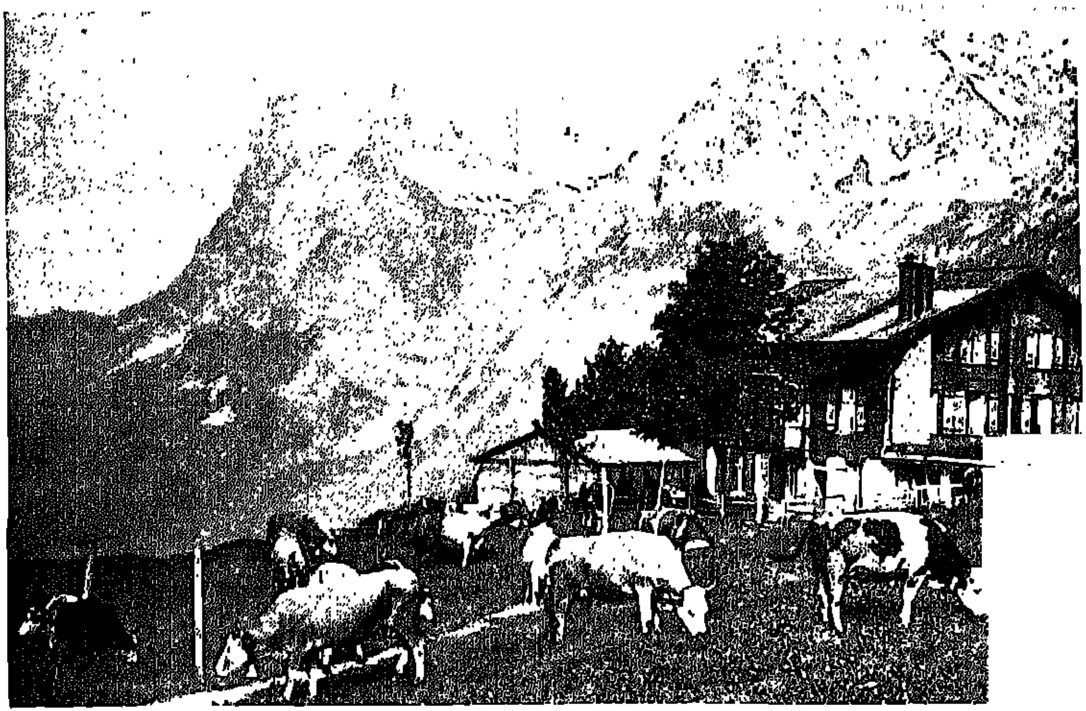
Mountain Scenery

Good pictures are an absolute necessity here. Verbal description, without the pictures, is almost useless, especially to such children as Londoners, who may have never seen, even, a high hill. Mountains, rushing torrents, waterfalls, and glaciers could all be introduced in a real manner by means of pictures, plus description. (*Many of the tourist agencies give away* splendid pictures in their brochures, e.g. The Polytechnic Tours, London.)

The Alps as a Holiday Centre

If the teacher can draw on his own experience, he should give it in detail, for the child appears to recognize at once the *real* experience, and values it accordingly.

Describe the winter sports of tobogganing, sleighing, ski-ing, and skating—the long day in the open air, and the welcome atmosphere of the cheery hotels in the evening. Give an account of the perils and thrills of mountaineering, showing pictures, if possible, of mountaineers in awkward spots. (Note the clothing worn, the heavily nailed boots, the connecting rope, the ice axe, and the alpen-stock.)



W. F. Taylor

FIG. 19

A Swiss Farm Scene

(Note the snow-capped mountains, the "alp" on which the cattle are feeding, the house and the outbuildings)

Show how the holiday centres are high up the mountains, where ordinary roads are few, and where the motor-car cannot reach. The visitors reach these places by means of mountain railways. Emphasize the high cost of building these railways, describing the cog and pinion used to prevent accidents; then ask the questions: Who pays for these railways, and why? Would the railways be built if only a few people used them? Why? From these questions the children quickly realize that the mountain scenery is a very valuable acquisition economically to the native peoples; catering for visitors is Switzerland's most valuable industry. After their previous studies, this may seem a very strange way of earning a living; yet it shows clearly that different peoples earn their livings in many different ways, according to the land in which they live.

The Pastoral Work of the Swiss

But not all the Swiss earn their livings by running hotels or acting as mountain guides. In winter the mountains and valleys are covered

[illegible]

An Alpine Hut

with snow, but in summer the valleys and slopes of the hills and mountains are covered with a layer of rich, juicy grass; only the mountain tops are snow covered. On the grassy slopes and valleys many cattle are pastured. The grassy slopes are called "alps."

The cattle are kept particularly for their milking value, so that Switzerland is famous all the world over for its dairy products. Remind the children of condensed milk, and Swiss milk chocolate.

Swiss Homes and Swiss Families

An attempt should be made to give the child an insight into the more intimate lives of the Swiss. The typical Swiss house or "chalet" should be described, mainly through pictures. Why are there large stones on many of the roofs?

The winter care of the cattle should be described; the stables are often built under the house itself, on the ground floor.

The gathering of hay from the *alps* provides a store of winter food.

Sometimes the Swiss farmer has a summer house as well as a winter house, the summer house being higher up the mountain, where he takes his cattle for the summer feed, the winter quarters being in the more sheltered valley. (Swiss industries and town life should be mentioned.)

Stories

A typical story might be told to illustrate certain topics of the life of the mountain dweller. For instance, the old story of the traveller and the St. Bernard dogs never fails to receive an enjoyable response from the pupil and is remembered when the most carefully prepared details of the lesson have been long forgotten. (The value of the story should be kept in mind; the teacher can often work all the details of the geography lesson into a "story.")

SUGGESTIONS FOR FURTHER LESSONS

The previous notes suggest the type of lesson that is likely to be most fruitful in giving the young student of geography the right perspective for his future studies. Hence, to save space, the remainder of this part of the course will be dealt with here chiefly under suggestive headings. Some of the details will be found under the second part of the course, which deals with "Our Food, Clothes, and Shelter."

1. *The Fruit Lands of Britain*

Tell the children that they are now going to pay a short visit to their own country. Even at this stage the teacher could obtain from the children the many different ways of earning a living in their own country—on the land, in factories, shops, builders, fishermen, etc. Mention could then be made that many people earn their livings as farmers of various kinds—wheat farmers and those who grow things, as well as cattle farmers and sheep farmers.

Then lead straight to the question of the fruit in the shops. Say that they are going to find out something of the life of the people in England who grow some of these fruits, and mention the fruits—such as apples, pears, plums, and cherries—that grow well in the open air in England.

Point out the county of Kent on the map. That is one of the most important fruit-growing regions in England.

The Orchards of Kent

For town children draw a diagram showing how fruit trees are planted. Explain how the fruit farmer ensures a good crop by routine seasonal work, such as pruning, whitewashing, spraying, etc.

Describe the appearance of the trees at blossom time, and explain the importance of the work of the bees, or other methods of fertilizing the flowers. Soon the blossom falls off the trees, carpeting the floor with a white and pink layer of petals. Only a tiny green knob remains of the beautiful flower. As the season progresses these tiny knobs get larger and larger until they are easily recognized as green apples or pears.

Harvesting the Fruit

Describe the picking (ladders), the sorting into various sizes, and the packing into boxes, ready for market.

Marketing the Fruit

The boxes are packed on to lorries or carts, and so to the railway station. The Kent fruit crop is most likely to go to London, where the city workers are willing to give good prices. If this is the case the fruit goes first to the famous fruit, vegetable, and flower market of Covent Garden.

Here describe how the fruit shopkeepers of London go early in the morning to Covent Garden market to buy by auction their requirements.

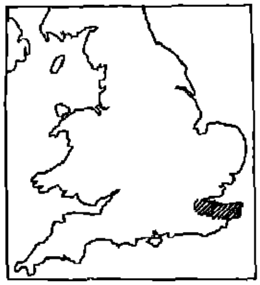


FIG. 20

The Fruit Lands of Kent

Why is Kent a Good County for Fruit Growing?

The lesson will not be truly geographical unless the children receive some ideas of the reasons for the fruit growing in Kent.

To young children the three most important things to mention are the suitable and fertile soil, sufficient rain falling at the right time of the year for growth, and the sunny summer days in which the fruits are able to ripen properly. Kent's nearness to such a large market as London is also a very important factor.

2. *Bananas from Jamaica*

The talk on the apples, pears, and plums of the orchards of Kent leads on to another very popular fruit that can form the foundation of an interesting geography lesson, as it will not grow in Britain, but only in very hot countries.

Let the children find out the West Indies on a map of the world. In many of these islands bananas grow wild, but most of the bananas seen in our shops come from one of the islands of the British Commonwealth, namely Jamaica.

Banana Cultivation

(See the notes under "Bananas" in the second part of the course for some of the details.)

Pictures again are an absolute necessity. Try to follow the life history of the banana from the cutting to the ripe "hands" before harvest, and then to the busy harvesting, the sorting, and packing, and so to the long journey across the Atlantic Ocean to London Docks. Let the children realize the enormous amount of work and the large number of workers required before they are able to buy a single banana.

This lesson need give only a preliminary glance at Jamaica, the detail being given in the next year's course.

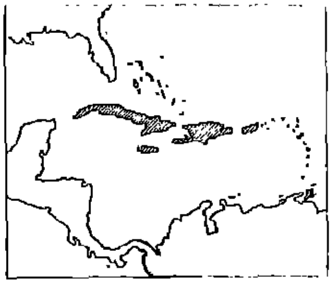


FIG 21

The West Indies

3. *The Land of the Sugar Cane*

The attention of the children could be usefully kept on the West Indies for another lesson, by an account of the cane-sugar industry of Cuba, although a connection with the last lesson could be made by stating that Jamaica, as well as producing huge quantities of bananas, also produces large quantities of sugar. But a neighbouring island produces ever so much more. That island is the larger island of Cuba, which produces more sugar than any other country in the whole world.

A Sugar-Cane Plantation

A picture of this should be obtained, and the peculiarities of the sugar-cane noticed. The canes are planted by cuttings, in rows, and quickly reach maturity.

Harvest Time

Most of the people of the large island of Cuba have work in connection with the sugar-cane industry. The teacher should emphasize this as showing how suitable climatic and soil conditions may favour one crop so much that, with world demand for the product, it may become the basic industry whereby the inhabitants earn their livings. (Compare England as the former "Workshop of the World.")

The sugar crop of Cuba is so large that, at harvest time, thousands of negroes from the neighbouring islands and the southern states of America go there to work in the sugar plantations.

The ripe canes are much taller than a man. They are cut down by means of sharp knives, the leaves are stripped off, and the long canes loaded on to carts or on to the miniature railways that run through the larger plantations.

The loads of canes are taken to the sugar mills, where they are crushed by machinery, huge rollers crushing out the valuable juice of the cane.

The juice obtained in this way goes through other operations in the sugar factory, where machines eventually produce brown raw sugar. This raw sugar is packed into sacks, and sent by railways to the nearest port, from where it is exported to the countries requiring it, and willing to pay for it.

Point out to the class that the best customer of Cuban raw sugar is the United States. What do the people of the United States send back in return for this valuable crop?

If possible, show a picture of the water front of Havana, the most important sugar port, the largest town and the capital of Cuba.

Pictures Required

1. A sugar plantation showing the harvesting of the canes, with negroes at work. This illustrates the comparative height of the canes.
2. The sugar canes loaded on to cart or rail, on its way to the factory.
3. The outside and inside of a sugar mill.
4. The water-front of Havana, showing the loading of the sacks of raw sugar on to the steamers.

(*Note.* As with other regions taken, the pictures should show the typical peoples of the region (in this case negroes). A few words might be given telling how the negroes first came to America as slaves.)

4. *The Arabs of the Sahara Desert*

This lesson is intended to illustrate the nomadic life of the peoples of the Hot Deserts. Hence the life of either the Arabs of the Sahara or that of the Arabs of the Arabian desert could be taken. Which is taken would depend largely on the illustrative material available. For young children, either will give the necessary introduction to life in the hot deserts.

The Sahara Desert

Point out its position on a globe, so that the class realizes that it is an enormous stretch in the continent of Africa, and lies in the tropics, between the Mediterranean Lands and the impenetrable hot-wet forests of the Congo. Describe briefly these neighbouring lands, in order to show later what a mighty barrier the Sahara is.

The next step should be a good description of the desert with the aid of good pictures. Try to show more than one picture. It should be pointed out to the class that this region does not consist entirely of flat expanses of sand, but that the major portion is made up of hills and valleys, while a considerable part is rocky mountain.

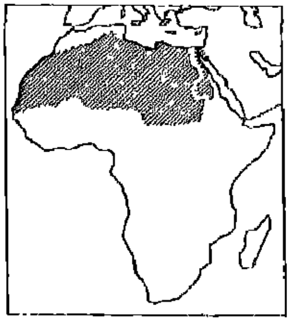


FIG. 22

The Sahara

The one common feature is its dryness; it is a desert simply because there is no water. Where there is sufficient water, the desert "blossoms as the rose."

The Peoples of the Desert

The inhabitants of the desert are very few, and these cannot stay long in one place because of the extreme scarcity of water. (Emphasize the absolute necessity of water for vegetable and animal life, including man.) Hence the desert dweller must be a nomad.

Their Work and How They Earn their Livelihoods

To-day, they act as traders who buy from and sell to the peoples on the more fertile borders (where there is more rain), or the dwellers in the oases.

Merchandise. Describe this, and include particularly the typical products or wants of themselves and of the peoples they trade with, e.g. dates from the oases or from North Africa; salt from the salt deposits of the desert; the products of their animals, and particularly the products whose value has been added to by what might be termed the "home industries" of the desert dwellers. Such goods as cloth woven from camel hair, rugs, and the very beautiful leather work, the leather for which was obtained from the flocks kept by the peoples of the dry pasture lands of the borders where less desert-like conditions prevail.

Animals of the Desert

The camel is the animal that all children will mention on being asked. The teacher should try to give the children the reasons for the ability of the camel to live under such peculiar conditions. (*Note* the feet, and the camel's ability to survive long fasts and long thirsts owing to its physical peculiarities—the hump and stomach.)

There are two main classes of camels (compare the different types of horses)—the valuable thoroughbred, used only to carry its rider, and the camel used as a beast of burden, able to carry heavy loads.

But do not leave the children with the idea that the camel is the only animal the Arabs are familiar with. Many tribes of Arabs count their wealth by the numbers of their flocks and herds; but, of course, these herds cannot find sustenance in the desert proper. They and their animals live either in those regions of dry *steppe land*, to be found on the edges of the desert, or at the *oases* where good pasture is cultivated.

The Homes of the Nomads

Naturally these will not be of a permanent nature. Show a picture of the typical tent used—quickly packed and quickly erected. Some of these tents make almost luxurious homes for the more wealthy of the Arabs, having beautiful carpets and rugs, and in some cases furniture that was made in Europe, as well as many other modern devices of Europeans. (The idea should not be conveyed that all Arabs live a very meagre existence, and are brutish, ignorant folk.)

To make the lesson more real the teacher might give an account of an imaginary journey of an Arab caravan, introducing as many geographical features into the story as possible, such as the packing and unpacking of the tents, what the Arab boys and girls did, how the tents were taken down and packed on the backs of the camels well before sunrise in order to travel during the cool hours, etc.

Clothes

The pictures used should show the type of clothes worn. This will naturally lead up to the question—"Why such thick clothes in such a hot country?" This introduces two topics of interest and importance in the lives of the desert dwellers, viz. sandstorms, in which the sand will be blown through almost any clothing, and the extremely cold nights compared with the excessive heat of the days.

If the teacher wished he could enlarge on both these topics, so that the class obtain an elementary notion of the occurrence of the sand in the desert being due to the sudden changes of temperature from day to night, with the consequent expansion and contraction of the rocks, which eventually split under the strain into smaller and smaller particles. These are battered against each other and against the rocks by the terrible winds that occasionally blow across the arid wastes.

Pictures Required

Pictures of camels in various circumstances; a caravan of many camels journeying across the desert; an Arab encampment showing tents, etc.; a picture of a typically dressed Arab (note the European type of features—with no negro element); veiled women; Arabs at prayer.

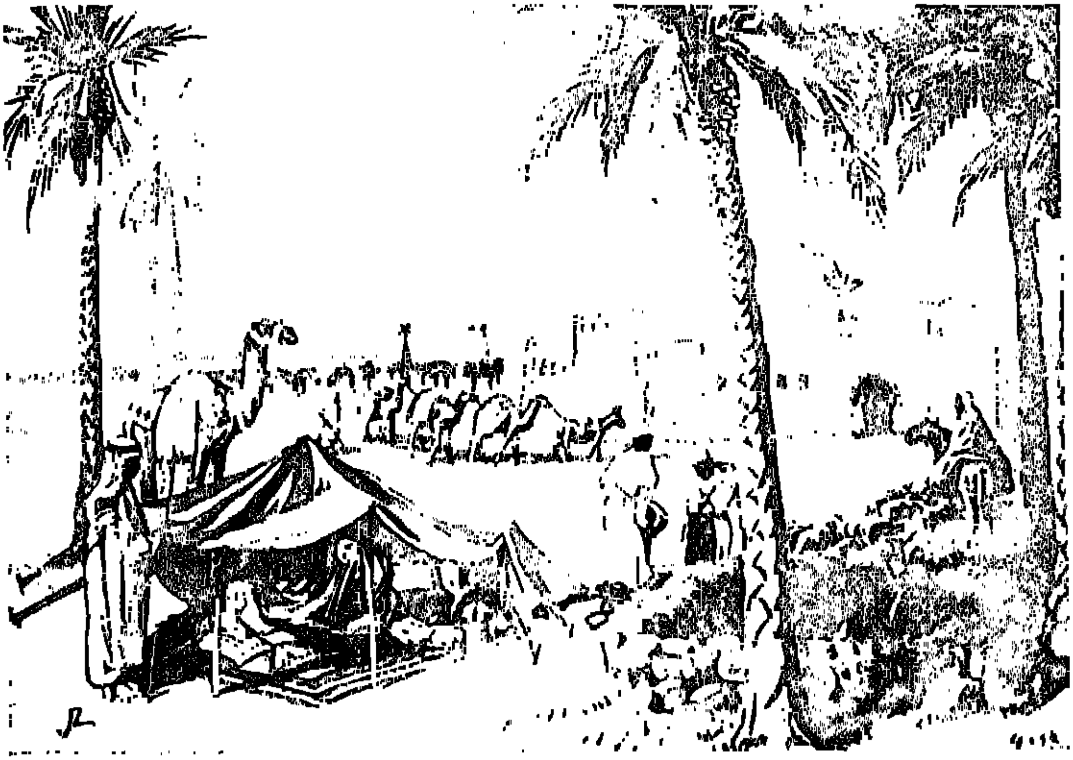


FIG. 23

An Oasis in the Sahara Desert

(Note palms, the flat roofs of the buildings, the clothes of the people. Note also the water pumps in the background)

5. *Life in a Saharan Oasis*

A place where water is obtainable, maybe because of the remnants of a stream, or, as is usually the case, the existence of underground water that has been tapped by means of wells, is called an *oasis*. In such places there will be settlements if the water supply is permanent. In some places in the heart of the desert there are large villages of thousands of people.

This forms a good contrast to the arid wastes of the desert; at the same time there is also the intimate connection of being the place where the desert blooms because of the presence of water.

A talk on the value of water to the nomad of the desert should be given, showing the method of obtaining this precious liquid, and the means of carrying it (in leather skins). In the vast extent of the Sahara desert the places where water can be obtained are invaluable. If it were not for such places, existence and travel in the desert would be impossible.

In the domestic economy of the desert *date palms* are the feature of the oasis. These trees and their products correspond to the reindeer in the Arctic tundra, to the rice of the Chinese coolie, and to the mealies (maize) of the South African native of the Reserves.

The date fruit provides food for man and camel, the timber is used for posts of the houses and furniture, the ribs of the leaves for baskets. The fruit also has the advantage of being easily preserved by drying.

At many oases there are fields of crops, vegetables, or fruits, as well as pasture land for cattle, sheep, horses, goats, and camels.

Homes of the Oasis

The houses are made of sun-dried mud, and have flat roofs. Point out the reasons for both, noting that sun-dried mud would be useless for house-making if there were much rain.

All kinds of trades also develop at the large oases. Naturally these trades will deal mainly with the requirements of the oasis dweller or of the nomad trader of the real desert. Notice particularly the making of leather goods of all kinds, harness, cloth made from the wool of sheep and goats, or of camel hair; a primitive metal industry will also most probably exist, to provide for the making and repair of such things as tools and weapons, or for decorative work in brass and other metals.

The Oasis as a Trading Centre

A view of an oasis from the air would show clearly the gathering of the permanent settlement round the well or water supply. The waving date palms would be a refreshing sight. The mud houses would also be as near as possible to the water supply. Perhaps around a fairly large oasis there would be a strong wall, built as a protection against raiders from the desert. The water and fields would show clearly against the sharp background of the scorching desert.

One of the most interesting things to be seen from the airplane would be the rough, sandy roads, tracks, and paths leading into the oasis from the desert. All routes from all directions would be leading to the life-giving water supply and the cool shade. In the distance might be seen a long caravan of many loaded camels raising a cloud of dust and sand as they slowly approach their resting place.

Much trade is carried on at the large oases. The laden camels from the north would be bringing salt and European goods from the towns of the Barbary states—from Algiers or Tunis—others from the south might be bringing some of the products from West Africa. (Note Timbuktu or Kano—large desert towns on the southern borders.)

Some of these goods would be traded at the oasis, and perhaps others would be bought for the markets of the caravan's destination. But all the traders (or raiders) from the desert are glad to rest in comfort and peace for a few days at an oasis, before they continue their long journeys across the Sahara.

Note. 1. The mosque and the calling to prayer of the Moslems.

2. Mention could be made of Egypt "the gift of the Nile" as a long oasis through the desert.

6. *A Trip Up the Amazon*

The last two lessons have shown how man lives in regions that suffer from lack of rain. Often in fighting against the forces of Nature, as illustrated by the desert, man loses the battle, with the usual consequences. As a very sharp contrast to the desert conditions, the class will now be taken to a region that suffers from an excess of the other extreme, viz. too much plant growth, so that by the end of the talks the class realizes that the tropical forest is almost as inhospitable to man and beast as the desert is.

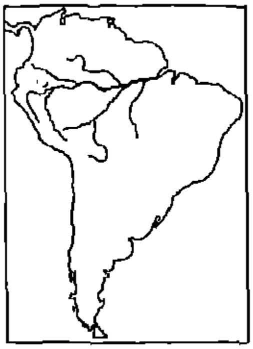


FIG. 24
The Amazon

The Journey to the Mouth of the Amazon

Take the ship from Southampton, and describe shortly the embarkation and the rapid voyage across the Atlantic, noting particularly how the weather gets warmer the farther south one goes, until the neighbourhood of the Equator is reached (teach the term Equator in this way).

Perhaps it would be preferable to disembark at one of the ports at the mouth of the Amazon, say, at Para, although it would be possible to go up the river in the steamer for many miles. By stopping at the mouth, the Amazon region itself tends to become more of a unit in the child's mind.

Through the Hot-Wet Forest of the Amazon Region—by Ship

Try to give the class some idea of the enormous size of the mighty Amazon, at first concerning its width at the mouth (compare with any river with which the child is familiar).

Describe the weather—very hot, very damp, so that it feels like being in a hot-house.

As the steamer progresses up the river the banks narrow, until it is possible to see some of the details of the banks.

As the steamer gets nearer one of the banks it can be seen that the river looks as if it were passing through a wall of plant growth, especially of huge trees joined together by a mass of creepers of all thicknesses, some as thick as a man's wrist.

Here a description of a landing, and an attempt to penetrate the forest could be described. Also a description of being in the forest could be given in order to bring out the contrast of its cool shade with the scorching heat outside.

The journey on the steamer could be continued with the aid of a map up to Manaos, the trading centre of the middle Amazon—a thousand miles from the sea. Manaos is the only large town in the whole of the region. How do the people live?

Collecting the Forest Products

The above makes an interesting introduction to the collection of raw rubber in the Amazonian forest. But the teacher should keep in mind that this region is no longer a chief source of supply; that honour belongs to the plantations of Malaya, where the trees are scientifically planted and tended under the supervision of Europeans.

Show pictures of the methods of the Indian collector of raw rubber in South America—the tapping of the trees, the collecting of the liquid into small cans, and the subsequent primitive methods of curing over a fire.

From the Depths of the Amazon Forest to the School Playground. This title suggests how the teacher might get the children to follow the movement of the raw rubber, and the consequent processes, until the rubber ball used in the playground is obtained.

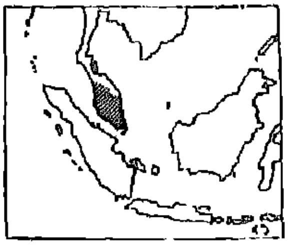


FIG. 25

Rubber : Malaya

Note the loaded boats going to Manaos, where it is loaded, to-day, on to large steamers that take it direct to Britain. Formerly it went straight to Para, at the mouth of the Amazon.

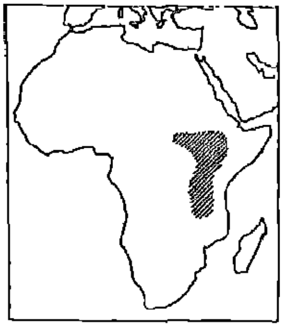
FURTHER DEVELOPMENT OF THE COURSE

Enough material has been given above to show how the course should be continued. The essential points to remember are—

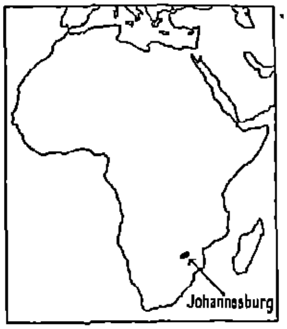
1. The children should be given detailed descriptions, that these descriptions must be accurate, and must be true to the *facts of to-day*.
2. Pictures are a necessity, and a lesson without them is of very little value.

Concerning the material for the remaining suggestions in the list of lessons given on page 384, some of this material will be found in detail in the next part of the course, where the origins of the more important of our everyday commodities are traced, and an account is given of the lives of the peoples who produce these necessities. For example

On a Canadian Wheat Farm, page 426.

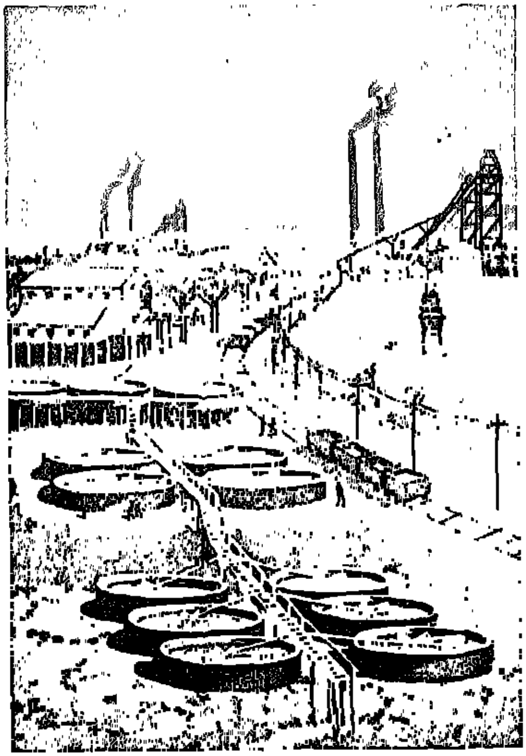


Big-Game Lands of East Africa



Gold-Mining, South Africa

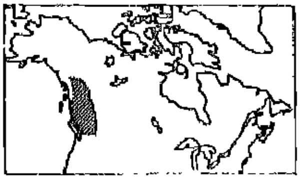
A Sugar Plantation in Natal
(Cutting and transporting the Sugar. Note the sugar mill in the background.)



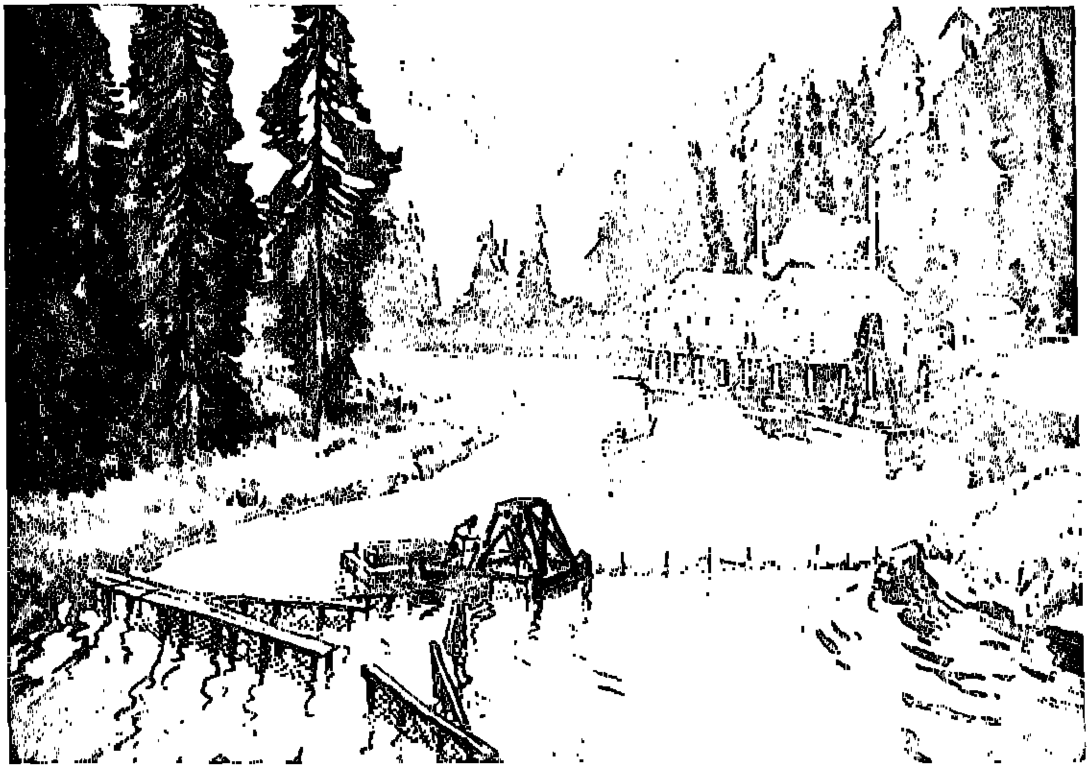
At the Head of a Gold-mine near Johannesburg
(Describe the pit-head machinery, how natives dig the ore, and how gold is obtained from the ore.)

FIG. 26

Centres of Interest in Africa



British Columbia : Forests and Fish (Salmon)



(*Notice the snow-capped mountains, the coniferous trees, the nets built across the river and the cannery on the bank*)

FIG. 27

Salmon Fishing in British Columbia

Coal-mining in Yorkshire, page 482.
On an Australian Sheep-farm, page 434.
A Tea Plantation in India, page 446.

Those which are not developed in this volume can easily be worked up from reference books and from books of travel. The details should always be gathered under the main headings of lives and work of the people concerned, particularly with reference to their food, clothing, and shelter, and how these essential needs are obtained very often from the region itself—especially in the case of more primitive peoples,

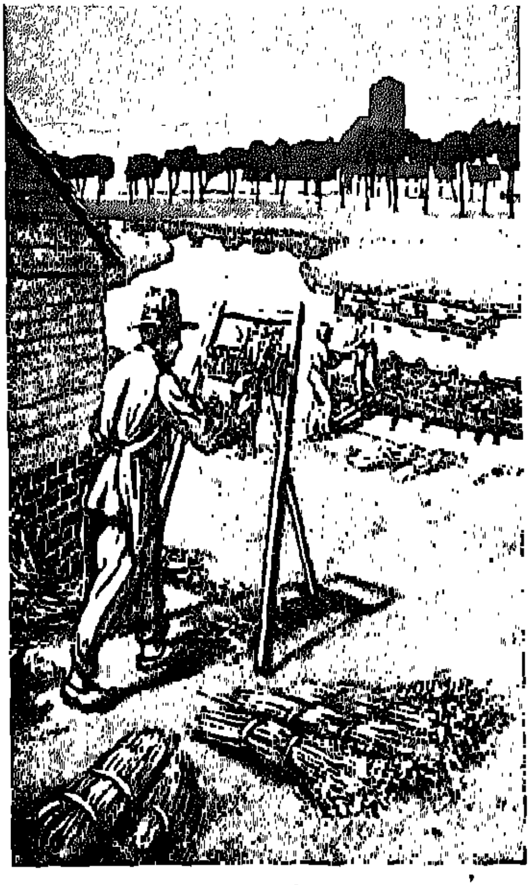


FIG. 28

The Linen Industry—Preparing Flax in Belgium

(Linen is made of the fibres obtained from the stems of the flax plant. Notice the man in the foreground. He is getting rid of the leaves, etc., by pressing a bunch of flax against a revolving, circular, steel comb. The men at the water's edge are placing the flax on a special frame, where it will be allowed to soak so that the fibres may be more easily separated)

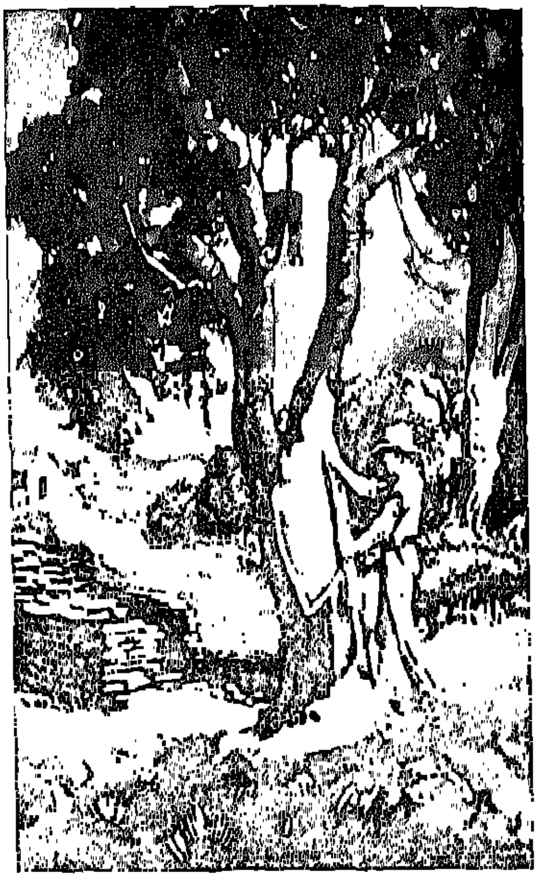


FIG. 29

Gathering Cork in Spain

(Much of the cork used in our lands comes from the Mediterranean region)

FAMILIAR THINGS AND HOW THEY ARE OBTAINED

OUR FOOD, OUR CLOTHES, AND OUR SHELTER

THE teacher could introduce this course of lessons by a general chat on the above necessities of mankind, and obtain from the class the wants, under the above heads, of the people in other lands. This would act as a general revision of the previous lessons on the life and peoples of other lands.

Similarly, a list of things required by the peoples of our own lands could be obtained from the pupils, and should be placed on the blackboard for reference. This list could be copied into a notebook, and should be referred to from time to time as the course proceeds.

Below are given the details and suggestions necessary for such lessons.

Food of the People of the British Isles

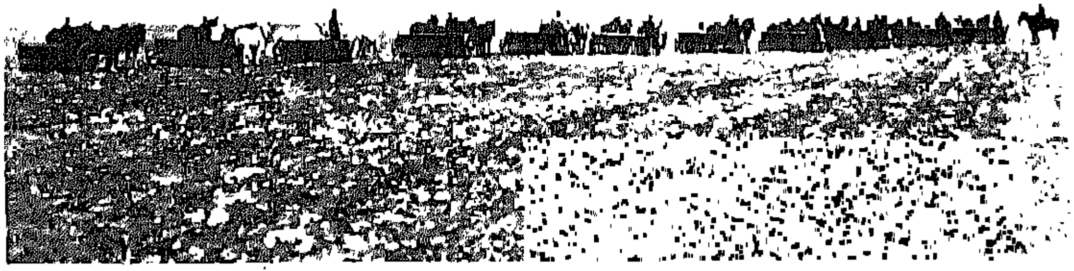
The following lessons will take the children to the various regions of the world where many items of their food and drink originate. In these travels and excursions they will visit Canada (wheat); Argentina (beef); Australia and New Zealand (mutton); America and Ireland (bacon); the North Sea (fish); regions of their own country (wheat, meat, vegetables, fruit, and jam); Spain (oranges); Australia (raisins); Jamaica (bananas); Cuba (sugar); China (rice); India and Ceylon (tea); Brazil (coffee); West Africa (cocoa); and so on. They will thus acquire a good acquaintance with the world as a whole.

BREAD

Bread has been called the "staff of life" because it is one of the cheapest, and the commonest, of the necessities in the diet of nearly all peoples.

A short lesson should first be given on *The Life of a Wheat Farmer* in Britain, in order to let the children recall what they may already know, by personal experience, or by pictures, etc. From this they could be told that so many people live in our own lands that not enough food can be grown there for all the people, especially as so many of them are engaged in occupations other than agriculture. Hence the people of our own lands must obtain much of their food from other countries.

At this point a map of the world could be



By courtesy of *Dept. of the Interior, Canada*

FIG. 30

Seeding Time on a Prairie Wheat Farm in Canada studied, and the position of these food providers noticed with reference to our own lands. The main products should be associated with the name of the country that produces them on a large scale, e.g. Canada for wheat; Argentina, frozen meat; Australia and New Zealand, mutton.

All the above suggest the type of introduction to the lessons which is likely to be of most lasting value. In this way the pupils should be very familiar with certain aspects of world geography by the time the complete course of lessons has been given.

A helpful device, as already suggested, is to fill up a large blank map with the above regions, as the course proceeds.

THE WHEAT-LANDS OF CANADA—THE BREAD BASKET OF THE BRITISH EMPIRE

Most of the bread eaten in the British Isles is made from flour obtained from wheat grown in North America. Much of this wheat comes from the prairies of Canada.

In the heart of Canada—many miles from the sea—lie some of the most fertile lands of the world. These lands, lying between the Rocky Mountains and the Great Lakes, are known as the *prairies*. They are vast stretches of natural grassland, on which trees are very scarce. These prairies are so level that one can see for miles—and see nothing but grass.

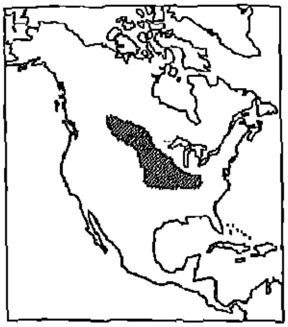


FIG. 31

The Wheat-lands of North America

Before the coming of the white man to North America these were the feeding grounds of millions of *bison*, who were hunted by the Red Indians, on foot, with bows and arrows. The Red Indians used the flesh for food, and the valuable skins for clothes and shelter.

To-day, neither the bison nor the Red Indians roam over these prairies. Instead, they are vast farming lands belonging to white settlers; wheat is easily the chief crop.

Canada is one of the largest wheat producing countries in the world, but the population is very small compared with the size of the country. Hence the enormous wheat crop is grown mainly for export. Much of the bread eaten in the British Isles is grown on the Canadian prairies.

The Life on a Prairie Farm in the Heart of Manitoba

A farmer of the prairies usually farms hundreds of acres of land. His farm is often many miles from a town or city, and he and his family and his workers are forced to live a very lonely life. However, it is a very busy one, in which men, women, and children all have their particular jobs to do.

In winter his farm is usually snowed up; the weather is extremely cold, but very bracing because of the dry atmosphere. Snow shoes, skis, skates, sleighs, and toboggans are common methods of travel in the neighbourhood of the farm. Not much work can be done out of doors in winter, but tools and machinery are repaired and kept in good order, ready for the heavy work of the warmer days.

Ploughing. As soon as the snow begins to melt the whole farm becomes very much more alive. The farmer and his men get their motor tractors in good order for the ploughing, and soon these heavy tractors are seen turning up the soil with their many clean-cutting blades.

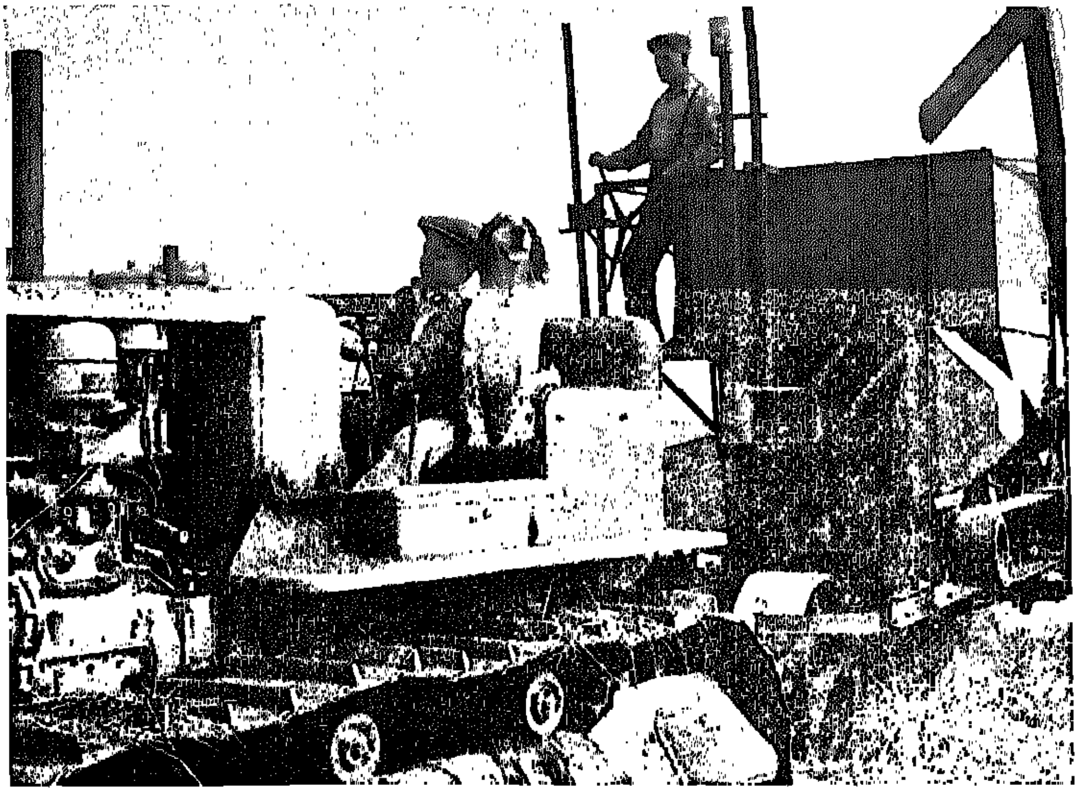
In Britain and Ireland the land is often ploughed by a man driving a horse and plough which cuts a single furrow; but in the prairie lands of North America one man drives a motor-tractor which cuts many furrows at one time.

Farming machinery of this kind is a very valuable help to the Canadian farmer in more ways than one. Labour is very scarce in Canada because of the small population, and the machinery not only does the work as well as a man, but it also does much more work in the time. If it were not for machinery the farmer would be unable to farm such large areas of the prairie.

Seeding. After ploughing and other operations the land is ready for the seed. Everything must be done as carefully and as quickly as possible, owing to the climatic fact that the growing season is very short. The wheat must be sown, grown, and harvested in the short time of about three months.

The farmer buys the very best seed, and the kind most suitable for the soil and climate. This is quickly sown by machines, which drop the seeds in lines and the correct distance apart.

After this operation the farmer must wait patiently for the seed to grow. But he does not have very long to wait. One morning, on looking out of his bedroom window, he notices with pleasure that his wheat fields appear to have been painted with lines of green during the night. These lines are really the tiny green shoots of the wheat, which have just peeped above the clean, brown earth. He hopes that the growing period will not be too dry, for the prairies in some regions suffer from lack of rainfall.

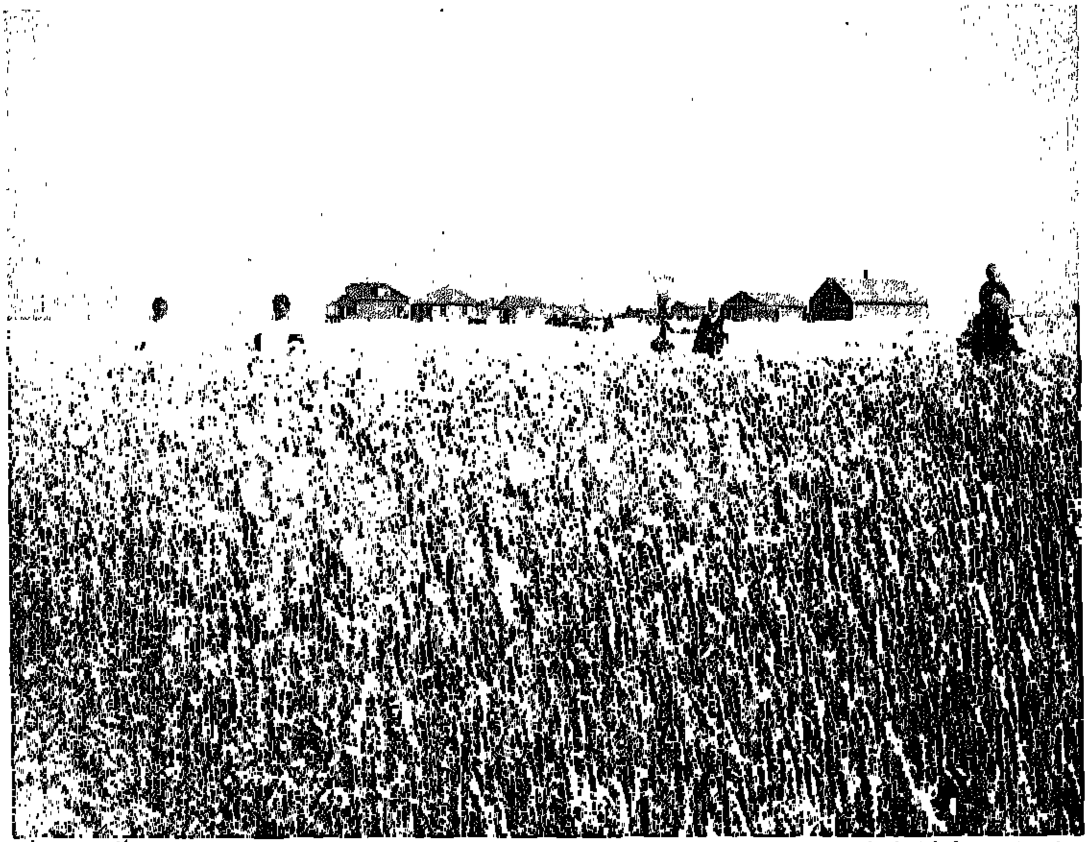


By courtesy of *National Film Board, Canada*

FIG. 32

Combine Harvester on a Canadian Farm, which can be driven by the Farmer's 12-year Old Son.

As the summer days become warmer and longer the ears of wheat at last appear on the ends of the long green stalks. Gradually they get larger and larger, and turn lighter, from green to a golden colour. At last the farmer decides that the wheat is ripe and ready for harvest.



By courtesy of Dept. of the Interior, Canada

FIG. 33

Wheat full-grown at a Prairie Farm near Calgary, Alberta

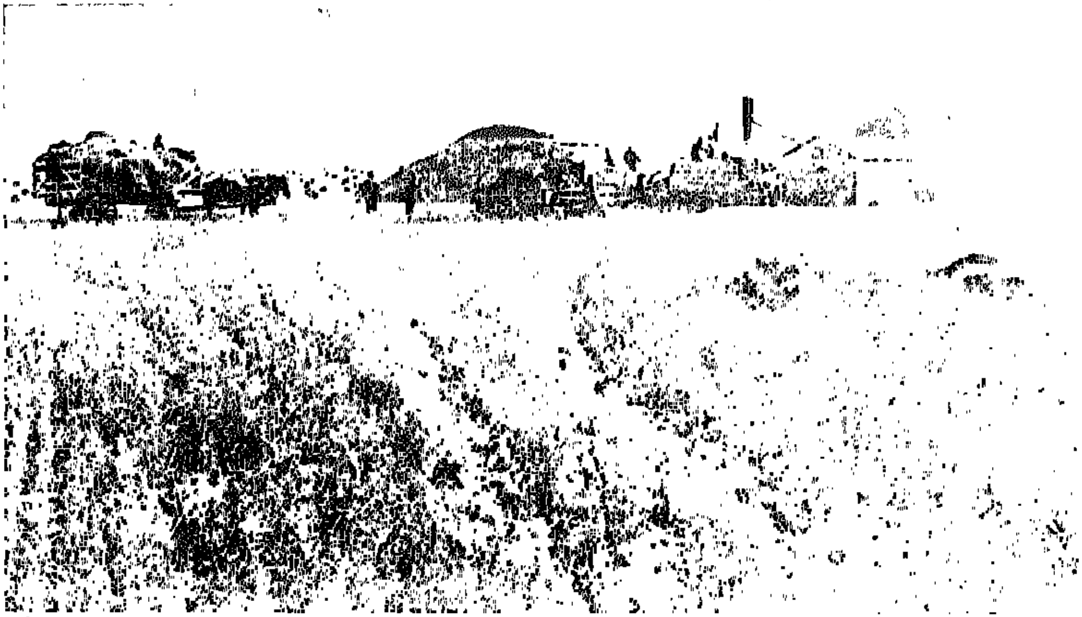
Harvest Time on the Prairie

Undoubtedly harvest time is the busiest time for the farmer. He has an enormous crop, which must be cut and threshed, and he cannot waste a moment until this is done, otherwise his valuable crop might be spoilt, and all his labour and the money spent on it would be wasted.

Harvest is the time when he finds the shortage of labour most embarrassing. Although wonderful machinery does most of the work of the harvest, yet the machinery must have men to guide it and to look after it. Also, he wants to get in the harvest as quickly as possible, and the more men he has to work for him the sooner this can be done.

The harvester is one of the most wonderful of these machines. It not only cuts the corn, but threshes it as well.

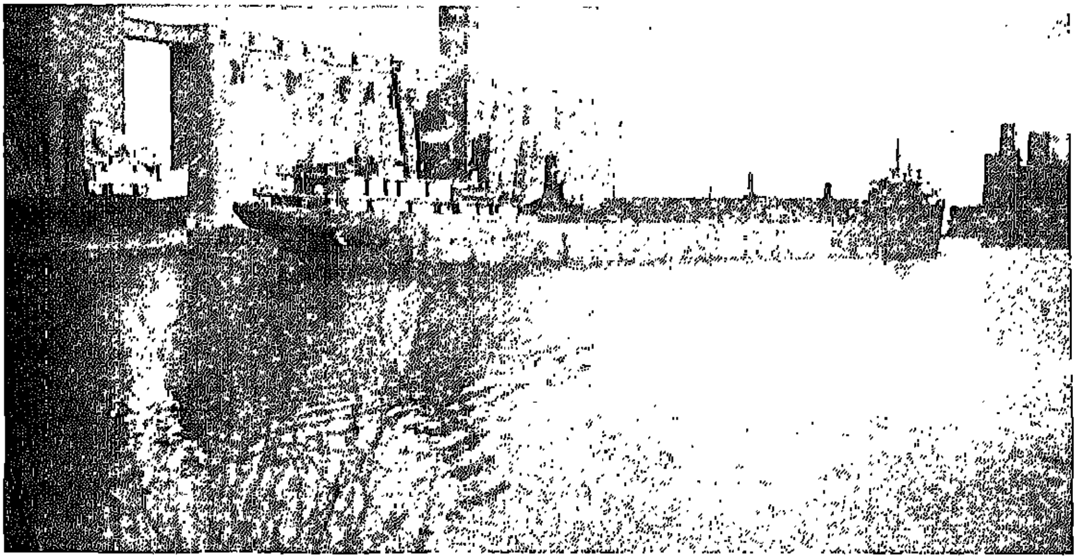
At last, after many weary days on the open prairie from early morning to dusk, most of the hard work in the fields is over, so that finally



By courtesy of *Natural Resources Intelligence Service, Canada*

FIG. 34

Threshing on a Canadian Wheat Farm



By courtesy of *Dep't of the Interior, Canada*

FIG. 35

Grain Loading at Fort William, Ontario

(The wheat is poured from the elevator into the ship's hold by means of pipes)

the fields have a bare and barren look, with only the straw stalks sticking up out of the dry earth. The Canadian farmer does not have to worry much about wet weather at harvest time, as does the British wheat farmer.

Later this wheat must begin its long journey—from the heart of the prairies of Canada to our own lands. An atlas shows what a long journey this is.

It is first taken from the elevator to the nearest railway station. From there it goes to one of the large market towns for wheat. Usually it goes by rail to Winnipeg, which is the largest and the most important wheat town of the prairies.

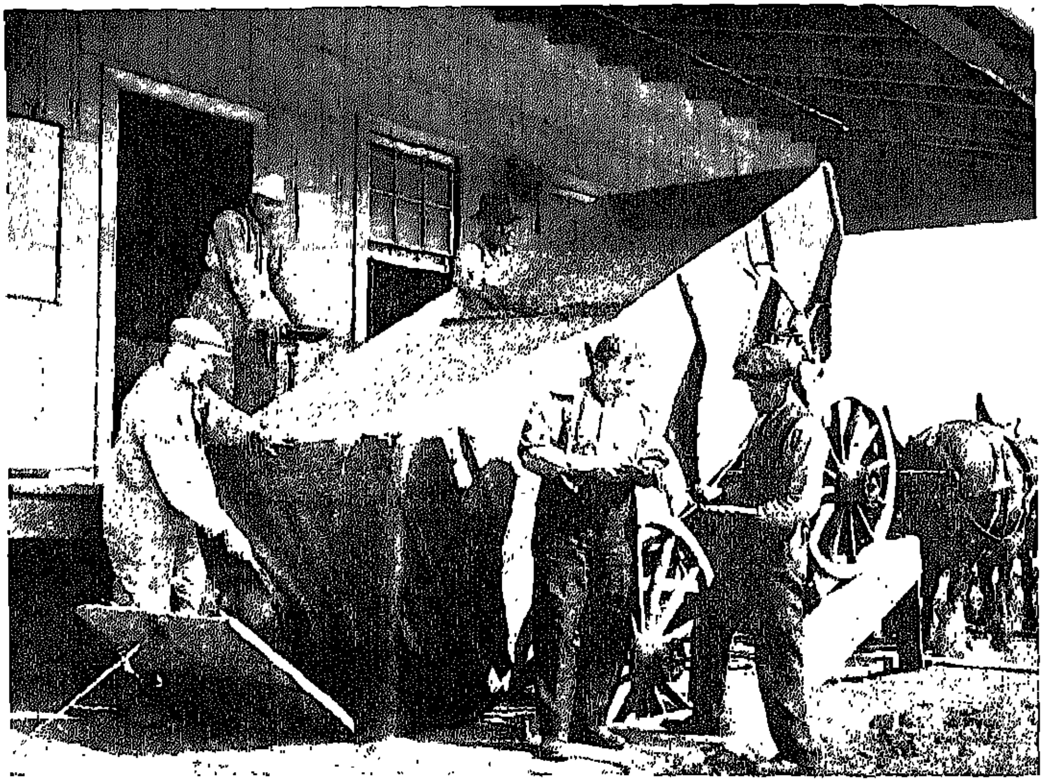


FIG. 36

Unloading Wheat from Truck

Transporting the Wheat

The farmer has by no means finished with his crop. The most important problem to him is to sell it, and get a good price for it.

The threshed wheat is packed on to wagons or lorries, and must make a journey to the nearest elevator. *An elevator* is a huge steel store-house for the wheat of the farmers in the district. When the farmer's wheat reaches the elevator, it is graded, and then sucked into the building by means of long tubes.

Winnipeg is a beautiful city of wide, straight roads, and many large and beautiful buildings. Notice its position. It is on the eastern edge of the prairie, it lies in the bottle-neck between the U.S.A. boundary and the lakes to the north; it is on the southern edge of the northern forest; and at the junction of the Assiniboine and Red rivers—in the heart of the fertile soil of the Red river valley.

The map also shows that the easiest route for the wheat of the prairies to go on its journey east is through the Winnipeg district.

All these factors have helped to make Winnipeg the important centre and market that it is to-day. Railways from all directions—north, south, east, and west—concentrate on Winnipeg, especially from the western prairies. Winnipeg is the greatest wheat market in the world.

MEAT

The class should be able to give the names of the various foods that come under the heading "meat." Of these, beef and mutton are the commonest, and consequently their geographical origin should be traced.

I. The Cattle Farmer of the English Cattle-lands

The study of the life of a typical English cattle farmer is valuable as a background to the studies of cattle farmers in other lands. It can be used for comparison and contrast. At the same time, the elements of the origin of the ordinary dairy produce, which is such an important factor in the life of the British farmer, could be taken.

The teacher should try to get the children to appreciate the varying importance of each product in the regions under study: e.g. *in England* the cattle are kept mainly because of the keen demand for fresh milk, fresh butter, and fresh "English grown" meat.

In Argentina the enormous industry exists to-day mainly to provide export of frozen or chilled meat. Until the advent of the refrigerator ship the industry existed mainly for the sake of the export of hides—the meat being mostly wasted.

The English Cattle and Dairy Farmer

On a railway or motor journey the majority of children have seen what the typical "country" looks like, and can remember something of its changing scene. Hence they would be able to visualize the difference between *pasture lands* and *arable lands* (lands growing crops).

The rural child is fairly well acquainted with the routine life of the dairy farmer, but a child from the large town is usually totally ignorant. Hence this lesson will be of greater value to the latter.

FIG. 37

An Agricultural Scene in Devonshire

(Remind the class of Devonshire cream and Devonshire cider)

The teacher should take the typical life of such a farmer and his family during the four seasons of the year. Any first-hand knowledge should be freely drawn from.

Farm Routine

The cattle farmer and his family live a very busy life from morning to night. Early in the morning the cattle are taken out of the sheds to one of the meadows of long, thick grass. In this meadow is often a pool of water, which the cattle can drink, and can stand in during the very hot weather.

The cows have nothing to do all day except "chew the cud," and whisk the flies off their bodies with their bushy tails. Twice a day they are milked—perhaps by the farmer's wife. The rich, foamy, creamy milk is kept in the cool dairy, which is always spotlessly clean. Much of this milk is sold to the people of the village or of the neighbouring towns; from the milk that cannot be sold, butter, and cheese are made.

In winter the grass of the meadows is not sufficient, and the quality is not good enough to feed the cows. In order to receive a good supply of milk from them, the farmer must give them other foods.

For this purpose he grows grass for hay and other fodder crops, oats, pulse crops, and fields of *root crops* such as beetroots, swedes, and mangel-wurzels. These are grown in summer and are stored at harvest time. During the winter the farmer draws from these stacks of cattle food, and the cows continue to give good milk.

As well as the root crops the farmer gives his cattle *cotton-cake* and *linseed-cake*. These cakes are the remains of the seeds of the respective plants after the natural oil has been squeezed from them. These cakes are very nutritious.

So far, only dairy produce has been considered, but the farmer also has a herd of *bullocks*; these do not give milk, but are fattened up as quickly as possible for the market. They are reared for the sake of the meat produced when they are killed. Hence the farmer looks after them very carefully, gives them the most suitable food, and plenty of it.

Market Day

On market days, if any of his bullocks are the right size, he walks them to the nearest market town, if it is not very far. If it is a fair distance he sends them by rail. At the market the cattle are sometimes placed in cattle pens, where the would-be buyers can inspect them. The buyers are usually butchers, for the bullock has only lived in order to become meat.

Market days are jolly affairs for the farmer and his family. They meet their friends, and have long chats, which are mainly about the state of the crops and the condition of the cattle, horses, and pigs. It is also shopping day, when he and his family buy their wants from the local shops, or from the sellers in the town market place.

It can be seen that these farm people are working hard all the year round, so that their produce may be consumed by others—usually by the people in the towns who do other things to earn their livings.

II. Frozen and Chilled Beef: Life on the Argentine Pampa

Much of the meat sold in the towns is not fresh "home-grown meat," but frozen or chilled meat. It has travelled thousands of miles before it reached our own lands. Most of the frozen or chilled beef we eat comes to us from Argentina.

Argentina is a large country in South America, and by far the largest part of it is an area of natural temperate grassland. Vast stretches of these grasslands occupy nearly all of the enormous plain drained by the mighty rivers flowing into the mouth of the river Plate. These grasslands of Argentina are known as the Pampa (i.e. the plain).

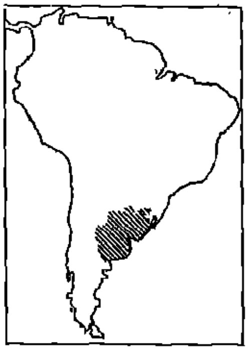


FIG. 38

The Argentine Pampa

The Pampa is hundreds of miles long and hundreds of miles broad. It is level as far as the eye can see; there is not a tree anywhere in sight.

The climate is much warmer than that of the prairie of Canada and fire-places are seldom built in the houses. The rain, which falls mainly in summer, is sufficient for grass to grow; most rain falls on the east coast lands, and the country becomes dryer and dryer as one travels inland.

All the above things help to make the pampa one huge natural pasture land. Millions and millions of cattle are reared there—mainly for export—in the form of meat.

Not many years ago the grasslands of the pampa were not even enclosed—and the cattle roamed freely over the thick pastures. To-day, not only are the lands enclosed in many areas, but the natural grass is being replaced by a crop known as *alfalfa*, which is very similar to the lucerne plant grown in England. This crop is easily grown, and makes a splendid food crop for the vast herds of cattle, which, as we have seen, are reared mainly for the value of the meat they produce.

No part of the world can show such a large meat industry as the Argentine pampa. More meat is exported from this region than from any other in the world. Most of the meat exported goes to Europe, thousands of miles away.

The Refrigerator Ship

How can the meat get to Europe in good condition? The invention of the refrigerator ship allowed this enormous export. Before that time the animals were reared mainly for the sake of their skins, which were very valuable to the leather industries of Europe and the U.S.A. With the refrigerator ship all this was changed. Carcasses could be kept in an eatable condition by freezing them during the long voyage from Argentina to Europe. When the meat arrived in Britain it could be easily thawed, and was perfectly good to eat.

The only trouble was that frozen meat is not so palatable, when it is cooked, as home-grown meat. To get over that difficulty the carcasses are now not frozen but are "chilled." This means keeping them at a low temperature, but only just below freezing point. The resulting meat is more tasty, and so receives a higher price in the markets of our own lands.

Packing and Export

Much work must be done in Argentina before the animals are ready for the refrigerator ship. They must be killed, skinned, cleaned, and prepared for the hanging up in the cold-storage rooms of the ship. Hence all along the coast of the pampa lands are huge factories, whose business is to prepare the carcasses after the animals have reached maturity. These factories are very wonderful places, for most of the work is done by machinery, which can do the work faster and better than hand labour.

Other factories concentrate on "tinning" the meat before export. Hence *tinned beef*. This means cooking the meat as well as putting it into tins.

Other factories deal with meat extracts and essences. The cattle lands and factories of the Bovril and Oxo companies are in these pampa lands.

The largest and most important of the meat-packing factories are at the great ports of the region—at Buenos Aires, Rosario, Bahia Blanca, and at Montevideo in Uruguay.

It is wonderful to think that the meat in the local butcher's shop was possibly browsing on the broad level pampa a few months previously, and that its body went through many processes involving very costly machinery, before it arrived at the London Docks as a frozen or chilled carcass wrapped up in a muslin bag.

Mutton

This lesson could be made to concern the sheeplands of Britain, Australia, and New Zealand.

III. The Sheep-lands and Shepherds of the British Isles

An introductory talk should be given to the children on the other great staple meat food—mutton. Let them talk of their own experiences of sheep grazing, if they have any. Broadly, the sheep-lands in Britain are the dryer lands of the uplands, which are unsuitable for either cereals or cattle, as, for example, the chalk lands of S.E. England, the Pennines, the Southern Uplands of Scotland, and the Welsh Uplands.

The typical life of a British Shepherd in any one of the above areas should be studied, so that the children obtain some idea of his work, and the reasons for this work in terms of earning his living. The two aspects of sheep rearing should be brought to their notice—sheep for meat, and sheep for wool.

Full accounts should be given of the shepherd's busiest times, namely, shearing and lambing.

All the above will act as the right background to the lesson that follows.

IV. Life on a Sheep Farm in Australia.

Australia produces more sheep than any other country in the world; Argentina comes second. (Shade both these regions on the blank map.) West of the east coast range of Australia the rainfall diminishes rapidly, so the natural vegetation of the inland plains of the Murray-Darling basin is mainly enormous grasslands. (Compare this with the pampa of Argentina—both being in about the same latitude in the southern hemisphere.) On these enormous grass plains are reared millions of

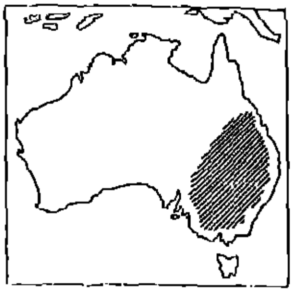


FIG. 39

The Sheep-lands of Australia

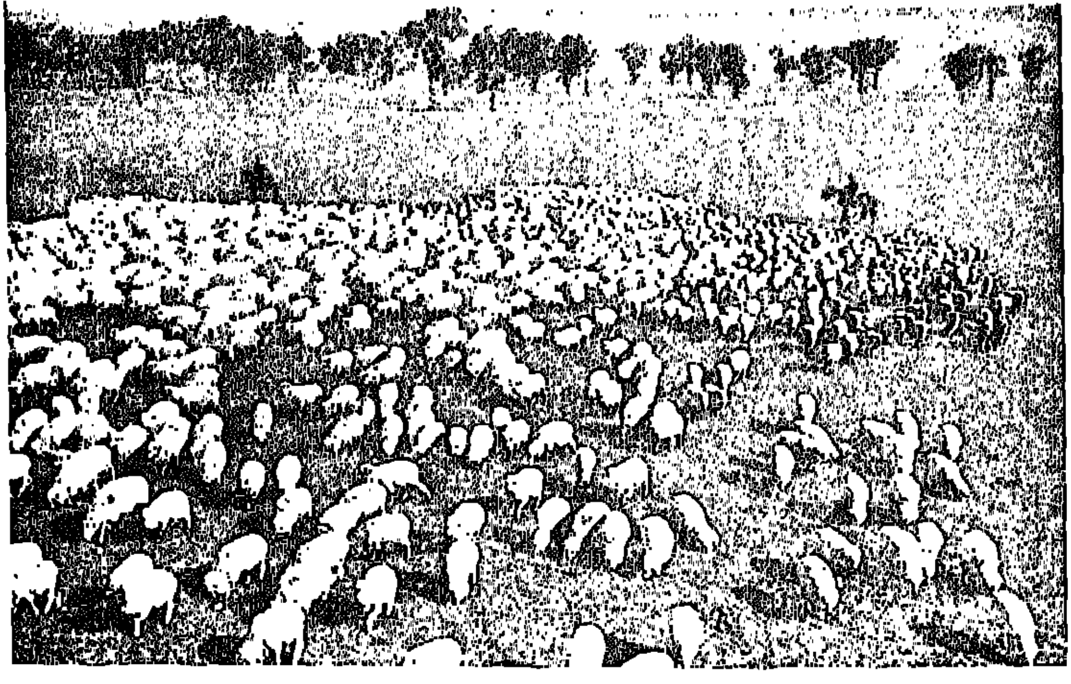


FIG. 40

Mustering Sheep for Shearing in Australia sheep. The sheep is the most valuable product of Australia.

A British boy or girl would find an Australian sheep farm a very interesting place, but very lonely. Many of the farms are a day's journey or more from the nearest village. One has to find one's amusements and interests on the farm itself, and from the people and animals that live there. One could not complain of too much rain—for one of the troubles of this region is its scarcity; the Australian sheep farmer is very pleased when there is extra rain, because he then need have no fear of drought that year. In some years hundreds of thousands of sheep die because of lack of water, and because the grass dries up.

The sheep farmer of the interior plains rears sheep mainly for the wool, rather than for the mutton. Australia grows, and exports, more wool than any other country. But some of the sheep give good meat, and where it is convenient to export the mutton, as on the sheeplands nearer the coast, the carcasses are prepared and sent by cold storage across the ocean.

V. Canterbury Lamb

Some of the best type of chilled mutton comes from New Zealand, which is many miles south-east of Australia. This mutton is known in England as Canterbury Lamb, because the sheep are reared on the region known as the Canterbury Plains. These plains are on the east coast of South Island; they are dryer than the plains on the west, and provide very good food for millions of sheep. (Shade the region on the map.)

All along this coast are meat-packing stations which prepare the carcass of the sheep for export. Much of this Canterbury lamb travels to Britain across thousands of miles of ocean, but it arrives at the London Docks in extremely good condition, and fetches a very good price in the butchers' shops.

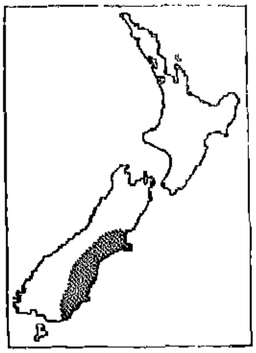


FIG. 41
The Canterbury Plains

Sheep farming does not require so much work as dairy farming. The busiest times for the sheep farmer are shearing times and lambing times. At *lambing time* the mother sheep are looked after very carefully by the farmers. The newly born lambs are very pretty, pitiful little creatures—with their heavy looking legs on such small bodies, and their continual bleatings. But they quickly grow into strong, healthy sheep, which provide tender mutton for the butchers' shops of our own lands—so many miles away.

Notice the possible routes taken by the refrigerator ships from Australia and from New Zealand to the London Docks. The ships could go either by way of the Suez Canal or by way of the Panama Canal. These routes take the carcasses half-way round the world.

FISH

This heading suggests the following titles for lessons—

On a Grimsby trawler in the North Sea.

With the Cod-fishermen off the Newfoundland Banks.

The History of a Tin of Salmon from British Columbia.

Our own lands are unable to produce all the meat and wheat required by the large population, but the surrounding seas can provide more than enough of another important item of food, namely, *fish*.

The seas round our islands are among the best fishing grounds in the world. Millions of fish of all kinds live in these waters, especially those that lie between Britain and Europe—the North Sea. The map shows that these seas surrounding the British Isles are shallow compared with the ocean depths. They are so shallow that the

British Isles are really resting on a shelf of partly flooded land, joining the continent to them. This is usually called "the continental shelf," because the western edge of the floor of these shallow waters drops very suddenly down into the real ocean depths.

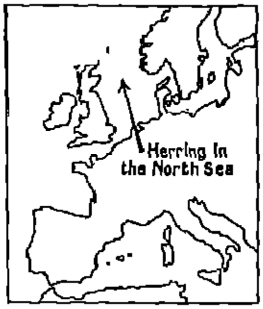


FIG. 42
North Sea Fishing Grounds

These shallow waters breed millions and millions of fish of all kinds—of all shapes and sizes. Most of them are edible. They breed better in shallow waters because such waters hold more food for fish. This food consists of tiny creatures that live in cool waters, or of food material brought down by the many rivers which flow into the sea from all directions.

Most of the fish seen in the fishmongers' shops were caught in the North Sea—plaice, sole, whiting, cod, haddock, herring, and mackerel are the names of a few of them.

In the centre of the North Sea is a much shallower area, known as the *Dogger Bank*. There the fish are far more numerous than elsewhere. Consequently, most of the fishing fleets of the North Sea make for this area, from which they obtain huge catches.

I. Life on a Fishing Trawler from Grimsby

Grimsby is the largest fishing town in the British Isles. Many of the people living there have work to do with the fishing industry, quite apart from the actual catching of the fish from the sea. In the harbour can be seen fishing craft of many kinds—the small rowing boat from which the fisherman drops his lobster baskets, sailing boats and ships, and the full-sized *steam trawler* which gets the largest harvest.

Let us see what happens on one of these larger trawlers, which is waiting at the quay for its crew.

The crew are all there at last, and ready for their strenuous voyage. What fine, strong, weather-beaten men they look! Rubber boots reaching to the tops of their thighs, and shiny waterproofs and hats show that they are well prepared for rough weather. And a glance at the hands of any one of them gives some idea of the very rough and hard work they have to perform.

At last they are all on board, everything is ready, and the captain gives the order to the man in charge of the engines to start. Straight out of the harbour steams the trawler—heading for the heart of the North Sea, and the Dogger Bank.

While the ship is on its way let us look a little closer at what can be seen on the trawler itself. The nets first catch our eyes, and we are made to understand exactly what a trawler net is. It is a large bag made of netting; the front is kept open by a heavy piece of wood fastened to the top of the net. When in the water the piece of wood keeps the mouth open, while a thick rope fastened to the bottom of the net drags along the bottom of the sea.

Hence it is easily understood that the trawler net is only used to catch the fish that live right on the sea floor. Such fish are plaice, sole, and similar *flat fish*, which live in the mud on the sea bottom.

But the crew are now busy letting down these nets, so we must watch them. As the ship is nearing the famous "Banks," a trawler net is being lowered on each side of the ship. The ship continues its course, the nets dragging the seas for the harvest which it is hoped will well repay the captain and the crew for their hard work.

After some hours the captain thinks that it is time for the nets to be hauled up. They are hoisted on board very carefully, for they are very expensive.

What a sight is the harvest of the sea, freshly dragged up from the sea bottom! Thousands and thousands of beautiful, glittering, squirming fish of all kinds, sizes, shapes, and colours! But if the majority are not the valuable flat fish, the captain is very disappointed.

II. Sorting, Cleaning, Packing

Now comes one of the busiest times for the crew. This huge catch must be sorted, cleaned, and packed by the time the ship gets back to

Grimsby, for the saleable fish must be ready for market as soon as the ship touches the quay.

The tinier fish are thrown back into the sea, while still alive, so that they later become more useful members of society!

In the hold of the ship are large bins and plenty of ice. The cleaned fish are packed with ice in these bins, so that they shall be quite fresh when they reach the market.

III. The Fish Market

(Describe the fish market.) Arrived at Grimsby the fish are hastily, but carefully, landed by the crew and the shore labourers who do this work regularly. The catch is immediately taken to the big fish market, and it is quickly sold. The large fish merchants from such big towns as London buy most of it.

The largest part of the fish caught by the Grimsby trawlers then goes to London by train, in special air-tight trucks. The destination is *Billingsgate Market*—the great fish market of London, and the largest in the world.

The fishmongers of London obtain all their fresh fish from Billingsgate.

Other kinds of fish, such as the cod, haddock, and herring, are caught in a different way, by means of drifter nets which do not drag along the bottom of the sea. (This should be done during the last year's course on the British Isles. See page 404.)

PORK AND BACON

The pig is a very common animal in most parts of the world where man lives. Possibly the main reason for this is that the pig requires very little attention in any particular way, and will eat things that other animals cannot. One usually thinks of a pig as eating anything that it can seize hold of.

Its snout is devised for the purpose of routing in the ground to dig up anything that it finds at all appetising. In many countries it lives well in the neighbourhood of forests, where it can feed on the forest fruits and seeds; acorns are particularly liked by pigs.

Formerly in many country regions in the British Isles, farm labourers kept one or two pigs. Rationing of feeding stuffs and government controls made this impossible during World War II and later. As country folks found their home-cured bacon very palatable, a return to pre-war conditions may be expected when controls are removed.

Other people prefer the usual kind of bacon that is bought in the shops. Very good bacon comes from Ireland, where millions of pigs are bred. Ireland is a land famous for its cattle, horses, and pigs. This is mainly due to the rich grass which grows there, owing to the heavy rainfall. But most bacon in the shops comes from across the seas. Much of it comes from the United States of America.

The Cattle and Pigs of the Maize Belt of the U.S.A.

It was stated above that Argentina is one of the great beef-producing countries of the world, and that most of the meat is exported. The United States of America is another country that produces enormous quantities of meat, but, as about 150 millions of people live there, much of this meat is consumed in their own land.

On the Argentine pampa, while formerly the cattle lived on the natural grass of the pampa, to-day they are fed on the alfalfa crop. A similar thing has occurred on the cattle-lands of the U.S.A. But the cattle are not fed on alfalfa, but on the maize crop, which is easily the largest crop of any kind in the whole world. It occupies millions and millions of acres, and is responsible for fattening millions of cattle and

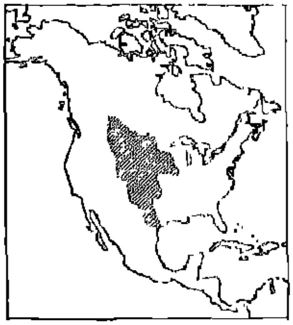


FIG. 43

The Maize Belt, U.S.A.

pigs. (Show a picture of the maize fruit, and of a field of tall maize.)

Let us try to get some idea as to how the pig from, say, Minnesota in the heart of the Maize Belt, is turned into pork or bacon, and arrives at last on our breakfast table.

Let us first imagine that it has grown full-sized and fat, on the Maize Belt, and that the owner thinks it is ready to be turned into food.

Meat Packing at Chicago

With many others, it is jostled into a railway truck bound for the nearest meat-packing town. As Chicago is the largest and the most important meat-packing centre in the world, we shall get the best ideas of the business if we study what occurs in one of the factories there.

Having arrived at Chicago, our pig and his fellow travellers first go to the *stock-yards*, where they are sold to one of the owners of the meat-packing plants. The pigs are sent to this factory and do not live much longer.

At the factory there are many wonderful rooms and machines which gradually turn the live pig into either cans of pork (beans are often included) or into bacon.

(Give a general idea of the "smoking" that turns the pork into bacon. Conclude by tracing the bacon from Chicago to Britain and so to the breakfast table.)

VEGETABLES AND FRUIT

Vegetables and fruit are a very important part of our diet, and should be eaten regularly, if we are to keep in good health.

The children will naturally be familiar with the common vegetables and fruit, so it should be interesting to trace the origin of some of them.

I. Market Gardening

Vegetables such as the potato, carrot, parsnip, turnip, and the various kinds of "green stuff"—cabbage, spinach, cauliflower, lettuce, etc.—are obtained fresh from our own lands. Some are grown on the consumer's own land—in gardens or allotments.

But the people living in towns cannot easily grow these things; they must buy them from the shops. These shops are provided with many vegetables by the market gardens situated just outside the towns.

In England the market gardeners tend to specialize in growing those things that are more difficult to keep fresh during a long journey—such as green stuff of all kinds.

The market gardener lives a very busy life all the year round. He has to grow only those things that people will want, and that they cannot buy easily or more cheaply from other lands. If all the market gardeners grow only one or two articles, then too many are placed on the market, with the result that the grower receives a very small price for them.

In the winter he prepares his land by careful manuring, ploughing, and even digging. He has to be far more careful than the farmer, and must take ever so much more trouble, because he hopes to obtain more value per acre.

Even in winter he may be growing things—in heated glass-houses—for the market.

Sowing. When the first days of early spring appear he is extra busy. His glass-houses and "frames" have already been prepared, and are ready for their sowing of seeds, such as cabbage, lettuce, onions, carrots, etc. These seeds are sown in frames so that the tender shoots can be protected at any time from inclement weather.

Transplanting. As the days become brighter the young shoots become taller and greener, until the gardener decides that it is time for them to be transplanted into the fields, which are waiting ready. This is the work of some days, according to the size of the plots, and the number of workers whom he employs.

A good market gardener has to arrange his crops so that they will not all ripen at the same time.

When they are ready for the market, he may take them himself, he may sell them to a local greengrocer, or he may send them to a central market to be sold.

The Market. In London, the largest market for this kind of produce is Covent Garden, which is the largest vegetable, fruit, and flower market in the world. Most London greengrocers visit this market each day to buy their requirements. There, they can always buy everything their customers are likely to want, and at the cheapest prices.

At *Covent Garden market* can be seen produce from places all over the world. Even the *fresh* vegetables, flowers, and fruit are by no means all from English market gardens. In the very early spring, before such things as new potatoes or new peas can be grown in England, they are on sale at Covent Garden, having arrived from France or from a similar warmer country not too far away. Spring flowers are also seen there, weeks before they are out in England, having come from the warmer Scilly Isles or the Channel Islands.

The harder kinds of vegetables, such as the potato, turnip, carrot, and onion, are not grown very much by the market gardener.

The potato is grown in large quantities in Ireland, where the heavier rainfall is more favourable to such a crop. The Irish people have a great liking for the potato, which is naturally very cheap there.

The children could be encouraged to think of a few more vegetables that are likely to be grown by the market gardeners in the neighbourhood of the large towns, and then asked to find out any peculiarities of the growth of each. Some suggestions are—celery, and its repeatedly buried stem, to ensure whiteness; watercress; asparagus; cauliflower; runner beans and broad beans.

On the whole, market gardening is one of the industries of the small man, which does not receive heavy competition from foreign lands. Compare this fact with the demand for fresh milk, fresh meat, and fresh eggs.

II. Fruits Seen in the Greengrocer's

Some very interesting lessons could be given in tracing the geographical origin of the common fruits, such as the apple, pear, cherry, strawberry, gooseberry, black currants, and red currants—all typical English fruits; the orange, lemon, and grape—typical of the Mediterranean type of climate; and the banana and coco-nut—typical of the tropics.

Only a few of these could be treated in detail but all of them could receive some mention. For preference, fruits from each of the above different types of climate should be taken, and their travels traced from their origin to the home greengrocer's shop.

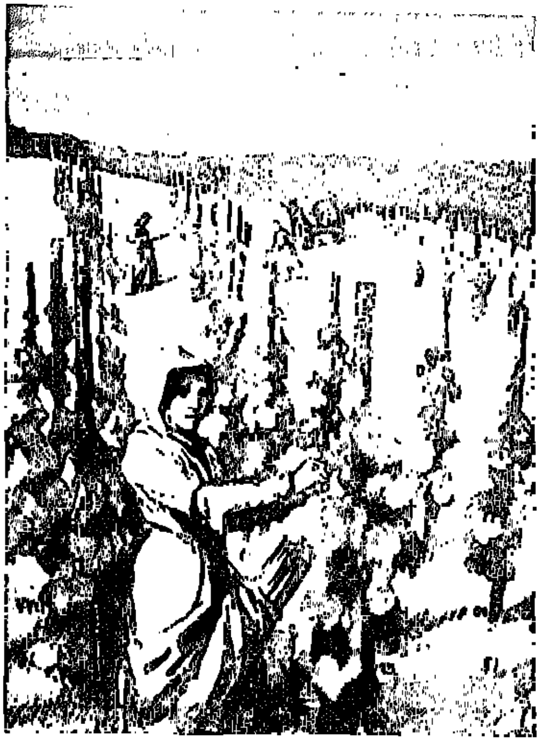


FIG. 44

A French Vineyard

(How the grapes are grown. Notice the man spraying the plants)

Suggested lessons are the following, which take the children to regions many miles apart—

The Apple Orchards of Kent.
The Orange Growers of Spain.
The Raisin Industry of Australia
Bananas from Jamaica.

III. The Apple Orchards of Kent

So many people live in London that enormous quantities of food are required by them. Some ideas have already been obtained concerning their supplies of bread, meat, fish, and vegetables, so it will be useful to study the supply of the enormous quantities of fruit that must be eaten daily by London's millions.

Our short study of market gardening showed us that people prefer fresh vegetables, home-grown, as long as the prices are not too high. The same thing applies to fruit.

Enormous quantities of fruit are imported from all parts of the world, even including fruits that can easily be grown in our own lands. But of the latter, the home-grown variety are still considered to be the best, and so have a very good market.

South-east of London is the county of Kent (shade in on the map). This county is famous for the fine-tasting fruits it produces, especially its apples.

Fruit growing is in some ways similar to market gardening, in so far as the grower has to take infinite pains in order to get a good crop.

Of course, the trees are already full size in most of the orchards, but it must not be forgotten that at some time some one had to plant them, as very young trees, in their dead-straight rows, and tend them carefully until they were of the age to bear fruit.

Seasonal Work

The fruit grower finds work to do on his trees during all the seasons of the year. In winter he cuts down any tree that has not been giving a good supply of fruit, so that it can make room for more profitable trees. The other trees are carefully looked after, pruned at the correct times, and protected from insects by grease bands and lime wash.

In Spring the orchard begins to take on a livelier appearance. Often the owner digs between each tree very carefully, so that the soil around the roots get plenty of air and rain. The trunks receive a fresh liming as protection against blight, and before many days of sunshine the tree appears with its first mantle of green and its beautiful pinky-white flowers. The farmer then hopes that no frost will occur at night to destroy the valuable blossom, for each flower might mean an apple.

Soon the flowers begin to fall, until the tree is surrounded by a carpet of petals. But each flower has left behind a tiny green knob, that will gradually, after many weeks, grow into a fair-sized apple. The trees must still be watched carefully, and the birds must be kept off if possible.

As the summer progresses the hard green apples are clearly seen, and the farmer then knows that he is going to get a good crop if the summer weather is reasonably favourable.

The Fruit Harvest

By August he knows whether he has a good crop of apples or not. When he knows they are properly ripe, the picking commences. As this has to be done by hand, it cannot be done very quickly. But as soon as they are picked he sends them to the nearest market, or to the market where he knows he can get a good price.

Some English apples, such as Cox's Orange and Blenheim Orange, always sell for a good price, because of their delicious flavour. Many of the apples from the Kent orchards are sent to Covent Garden market, where they are quickly sold to people who prefer an English apple to a foreign one.

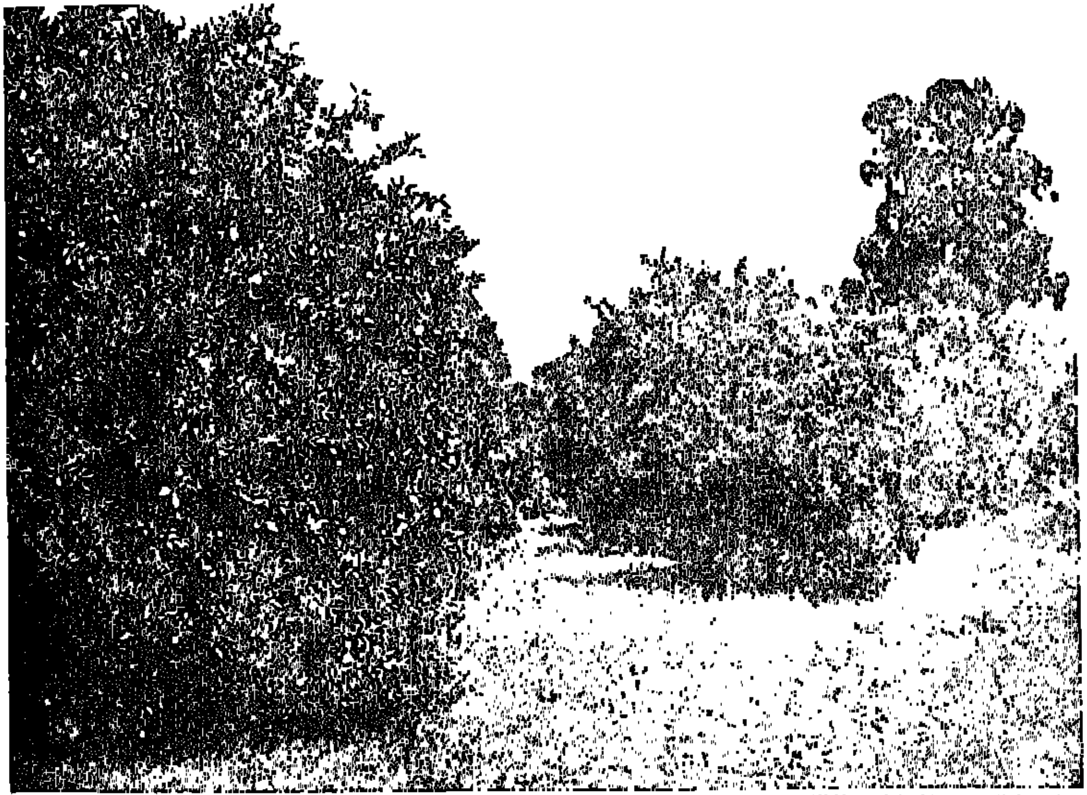
Soon after the fruit has been picked from the trees, the leaves begin to brown, shrivel, and eventually fall off, as the windier days of autumn arrive.

At this time of the year the apple grower carefully prunes his trees, and sees that everything is done to protect them during the cold winter months. His trouble is usually well repaid during the next harvest.

Kent is a fruit-growing county because the climate of this part of England is especially suitable to fruit growing. It is one of the sunniest counties; yet the rainfall is ample for fruit trees. However, fruit does not flourish in every part of Kent, but usually in the lowlands, where the soils are a mixture of porous and non-porous materials (note chalk and clay). The hills in Kent do not grow fruit or any type of tree; this is mainly due to the porosity of the chalk.

IV. Other Fruits of Kent

As well as apple, pear, cherry, and plum trees are conspicuous. Many strawberries are also grown; but these do not grow on trees. The strawberry plant grows low on the ground. It requires much attention during growth, and the fruit has to be picked very carefully, as it is easily damaged.



By courtesy of *All Year Club of Southern California*

FIG. 45

A Typical Orange Grove in Southern California

Other common English fruits are gooseberries, black currants, red currants, and raspberries. All these have a ready sale in their seasons.

Jam Making

Huge quantities of the softer fruits are turned into jam. Some of it is made at home by mothers and sisters for the benefit of their families who like sweet things. But much more is turned into jam in the jam factories situated very near the fruit-growing areas. This jam making only occurs at the time when the fruits are fresh, for perfectly fresh fruit is necessary.

Note. If the school is near a large fruit-growing region such as the Evesham district, it would be better for the teacher to concentrate on the area nearest home.

V. Mediterranean Type of Fruits

Once the common fruits of the homeland have been taken as above, the same method might be used to show how and where other common fruits are obtained. But it will be more educational to take them in a geographical order.

Oranges, *lemons*, and *grapes* (including such forms of the grape as the currant, sultana, and raisin) could be taken as typical of the fruits grown in those regions of the world that have a Mediterranean type of climate—of hot summers and mild winters, with rain falling only in winter (winter rain and summer drought). Such areas are the Mediterranean lands proper, California, South Chile, Cape Colony, and the south and south-west of Australia.

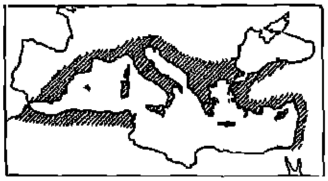


FIG. 46

Mediterranean : Fruit-growing Lands

The lands round the Mediterranean Sea should be made the basis of study, to which the other areas could be compared. (The regions should be marked on the large blank map as having similar climatic conditions, and, therefore, similar products.)

VI. The Orange Growers of Spain

Many of the oranges sold in British shops come from sunny Spain. The thin paper wrappers show exactly whereabouts in Spain they are grown.

Spain is much warmer both in summer and in winter than our own lands. Juicy fruits such as the orange and lemon require a warm climate with plenty of sunshine during the ripening season. This kind of weather occurs in the lands whose shores are washed by the waters of the Mediterranean Sea. These lands receive most of their rain in winter time, while in the summer the days are hot, with continual sunshine. Hence fruits are able to ripen well. Lands with a climate such as the above are particularly suitable for growing fruits such as the orange, lemon, and grape.

Orange trees usually require more care than apple trees, because the grower often has to arrange for irrigating his orange groves during the dry season, namely, in summer.

A peep at an orange grove shows the trees in straight rows with about 20 ft. of space between. The orange trees present their best appearance in spring, when the effects of the winter rains are seen in the new growth and freshness, and in the covering of the beautiful orange blossom.

An orange tree does not begin to bear fruit until it is about 4 years old. Then, provided the grower gives it proper attention, hundreds of juicy oranges are obtained from it for many years.

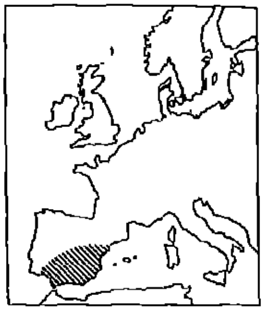


FIG. 47

Spain : Orange Growing

When the blossom of the trees is fully grown, the bees visit it, taking the sweet honey away with them. At last the dainty white petals fall to the ground, making a carpet of white around the trees. But, if they are good fruit-bearing trees (and the grower will not have any others taking up the ground), each flower has left behind a tiny green knob, which will gradually enlarge until summer time.

The long, hot, rainless days of summer turn the green oranges into the golden balls whose contents are so refreshing. At the end of the summer the oranges are ready to be picked. Those that are to be sent to Britain must not be left on the trees too long, or they will be over-ripe before they have finished their journey to our own lands.

Orange picking is the busiest time in the orange groves. The orange groves of Spain often cover many acres, so the owner has to employ many men and women at harvest time to gather the fruit. Each orange has to be cut off the tree with a sharp knife, and placed carefully into a basket. When full, each basket is taken to the sorting and packing sheds.

The oranges are first sorted into three sizes.

Then they are cleaned and wrapped carefully in the tissue paper that shows the name and place of the orange grower. The last process of all is the packing of the oranges into the long wooden boxes that are to be seen in any greengrocer's shop.

Wagons take these boxes to the railway station. The train takes them to the nearest port, where they are hoisted on board ship for the voyage to Britain. It is easy to understand the care with which the orange has to be treated to ensure that it is not spoilt on its travels from the orange tree in Spain to the greengrocer in our own lands.

The teacher should tell the children of other lands where oranges are grown, namely, those having the same kind of climate as the Mediterranean region. But particular reference should be made to *the Cape Province of South Africa*, where the oranges are gathered in our winter time, because that is the summer time there. This gives a great advantage to the South African orange growers.

VII. The Raisin Industry of Australia

The largest island in the world is Australia. It is many times larger than the island of Britain. It is so large that it has many regions totally different from each other. Some are so extremely hot—in the north—that tropical trees such as coco-nut palms grow there; in other areas—toward the south and east—thousands of square miles of grassland occur, on which live millions of sheep.

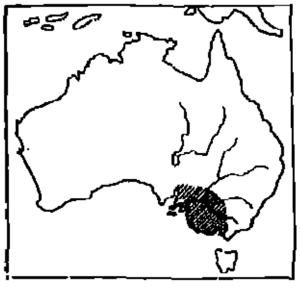


FIG. 48
Raisin Industry of Australia

But in certain areas along the southern coast there are regions that have a climate very similar to that of the lands round the Mediterranean Sea—hot, dry summers and mild, wet winters. Consequently, these regions of Australia are able to grow similar plants and trees. For example many grapes are grown, and some of these are turned into wine, which is exported.

One of the most famous of these Australian fruits is the raisin, of which Australia exports many tons to Britain. Every grocer in the British Isles sells them to-day.

The raisin is simply a dried grape. In their dried form these fruits last ever so long, and so can be transported thousands of miles.

In Victoria there are thousands of large vineyards, whose grapes support the ever increasing raisin industry of Australia. When ripe the raisins are picked and, if possible, allowed to dry in the bright sun. When dry they are carted to the raisin-packing factories.

Note the importance of the climate to the industry, in enabling open-air drying. This saves heavy expense.

Currants and sultanas should also be referred to in this lesson. If the lesson is taken near Christmas time, a very interesting method of approach would be to take the children on "Travels to Many Lands" in search of the ingredients of the Christmas pudding.

VIII. The Banana Industry of Jamaica

Most of the bananas seen in the shops come across the Atlantic Ocean from the shores of the Caribbean Sea. Jamaica, one of the few British possessions in this region, sends millions of bananas.

The banana is the fruit of a tropical tree, which is found in nearly all tropical regions having a good rainfall. In Jamaica these trees are grown in plantations, from cuttings. The cutting grows so rapidly in the hot, moist climate that at the end of a year it is 20 ft. high, and produces a good crop of bananas.

As usual, on plantations of all kinds, the busiest time is at harvest. But the banana is not gathered when it is ripe; it is gathered when it is green. It is then able to ripen during its long voyage across the sea.

A picture of a banana tree will show how the banana grows in large bunches known as "hands" (the separate bananas are known as "fingers"). The bunches are carefully cut from the trees by negroes and taken to a shed on the plantation; there they are inspected to make sure that they are in good condition for transport.

From the plantation the huge bunches of fruit are taken by road or rail to the nearest seaport, where they are loaded on to a steamship by negroes and negresses, who carry bunches of 50 pounds on their heads.

When the ship is fully packed it starts on its long journey to our own lands. It can easily be understood why the bananas are packed green, and why great care must be taken in transporting such a cargo.

IX. The Rice Growers of the Monsoon Lowlands

In the British Isles rice is mainly used for rice puddings. But in China, Japan, and India, for example, rice is the most important food of the peoples. For nearly one-third of all the people of the world, rice is the "staff of life," and is as important to them as wheat is to us.

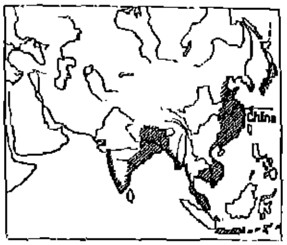


FIG. 49

The Rice-lands of Asia

Rice will not grow in our land because it requires a much warmer and wetter climate. It grows best in the warm climate of the river valleys of the Monsoon Lands of India, China, Japan, and Indo-China, especially of the broad part of the rivers near the sea. There the climate is hot, the soil is good, and there

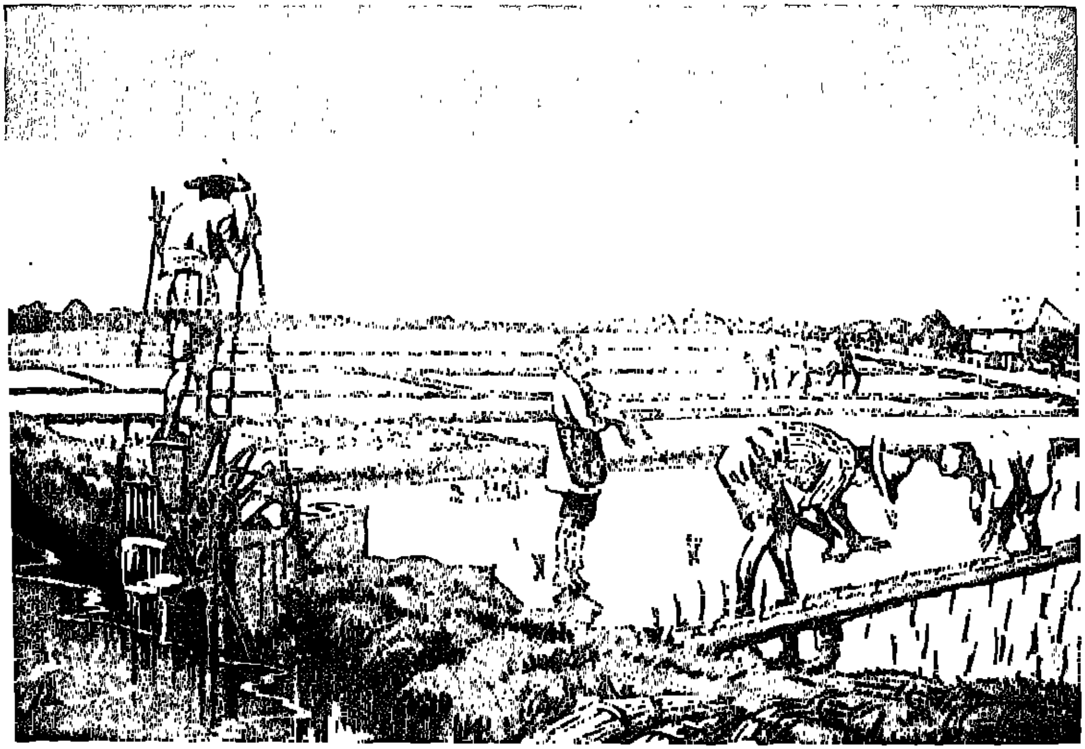


FIG. 50

Planting Rice in China

is plenty of water for this crop, which for most of its life grows on land that is flooded. (Shade the regions on the blank map of the world.)

The work of the Chinese rice-growers of the Yang-tse-Kiang Valley could be taken as a typical example, which would apply almost as well for Japan, Indo-China, and India.

Rice growing requires much labour, but the Chinese are very hardworking, the population is very dense, and the coolies work for very small wages. They are so poor that many of them are forced to live on rice alone! They can seldom afford to buy any other food.

Seasonal Work

The Chinese rice grower may be considered more as a gardener than a farmer. He sows the seed for his crop on a small patch of land, and when it begins to grow he transplants it into the larger rice field. This field has already been ploughed by water buffaloes, who are so strong that the work of ploughing the heavy, wet, and usually flooded ground is not too hard for them.

All the young seedlings have to be planted by hand, and a common sight at this time is the labourers walking with bent backs, planting the young rice plants in a field covered with a foot of water.

Water is so important to the rice plant that the rice fields are situated on the lowlands near the coast, or on the flood banks of the rivers, in such a way that they can be easily flooded. In most cases canals have been dug, so that the farmer can flood his fields whenever he wishes to.

In China, and especially on the rice fields, every one has to work very hard—even the women and children. The women do almost as much work in the fields as the men, especially in keeping down the weeds which grow so quickly in such a favourable climate. One of the jobs of the children is to keep off the flocks of birds which would quickly make havoc with the young crops.

When the rice plants are fully grown they have a somewhat similar appearance to wheat or oats—with a thin stalk, long, narrow leaves, and the ear of ripening grains.

Harvest Time

Most of the rice crop of China is cut by hand; the land would be too wet for machinery to be used easily, even if the Chinese wished to use it. When cut, the rice is bound into small bundles, and set out in rows to dry.

Later the harvested crop is threshed, usually by hand, and the ripe rice seeds are separated from the straw. But the rice left behind does not yet look like the rice used for making our rice puddings. First the husk has to be removed; this is done in the rice mill. The rice is then in what is known as its *unpolished* state. Most of the rice used in our country has been passed through a machine which polishes the rice and makes it look nice. Unfortunately, the rice loses much of its food value in this process, so that it is more sensible to buy unpolished rice.

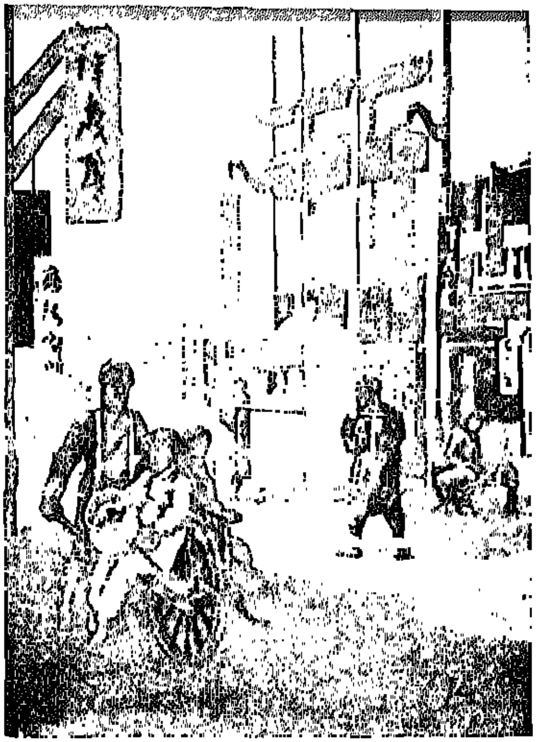


FIG. 51

A Street in a Town in Eastern Lands—China

At last the rice is ready for the market. But it is first graded, and then the various grades are poured into sacks ready for whoever wishes to buy.

The Chinese peasants are very careful, and, possibly because they are so poor, they waste very little. Almost every part of the rice plant is utilized in some way. The straw is used for many purposes—fodder for the animals, thatch for the houses mats and curtains, and even sandals, hats, and the strange looking coat worn by the coolies. This coat has the appearance of a thatched roof, and it serves a similar purpose, for it makes a very good and cheap mackintosh for the poor worker.

Note. The above lesson should amplify, and fill in the geographical gaps in, the knowledge obtained during the previous year, when a first visit was made to China.

Other Details

Either the present lesson or the former one should give other details concerning China, such as life in one of the large towns—Pekin, Shanghai, or Canton. The chief aim should be to let the children receive the impression of a very dense population, very hard working, with an old civilization that has produced very valuable knowledge.

Pictures of towns, country scenes, the walls of China, the sampan and junk life on the rivers, palaces, tea plantations, and pictures of the urban and merchant classes as well as those of the coolies of the rice fields will do much to give the children correct ideas of the Chinese and of the vast extent of their country.

BEVERAGES

Man cannot live without drink. Water is usually almost the only drink available for the uncivilized man, and for civilized man water is also an absolute necessity for life. A population map of the world shows that man has settled in those areas where fresh water is most easily obtained.

All fresh water comes from the sky originally—no matter whether river, lake, well, or spring (see Pitman Film Strips "Water in the Service of Man.") Hence the regions of the world that have most people have also an abundant supply of rain. (Show a large rainfall map of the world, and refer to the regions already studied.)

In the large towns the water supply for the hundreds of people is a most important problem, that has only been solved by clever scientists and highly skilled engineers. The water supply for London comes from many miles away, while that of Birmingham is obtained from a huge reservoir built by damming a large lake in Wales—Lake Bala.

Our Local Water Supply

A valuable lesson could be given to the Juniors at this point on the origin of the water supply of their native town At the end of the lesson they should have some idea of the work and care entailed in supplying them with even such a common necessity as water.

From this, the children will quickly supply the teacher with the names of other drinks—the commonest being tea, coffee, cocoa, milk, lemonade, beer, and wine.

Of these, the origins of tea, coffee, and cocoa should be traced in detail, while the others could be treated more summarily.

I. Life on the Tea Plantations of India

To-day, one of the commonest drinks in all British homes is tea. But about one hundred years ago very few people could afford to use this luxury; tea was so scarce in Britain two hundred years ago that one pound of it often cost about £10. One of the reasons for this scarcity was that it had to be transported thousands of miles across the ocean from China, where tea had been drunk for thousands of years.

China is still one of the countries growing enormous quantities of tea, but to-day the tea most popular in our country comes from India or Ceylon. (Shade in the tea-growing regions of the world on the blank map.)

Tea is made from the young, dried leaves of the tea plant. This plant, which can only flourish in hot countries, is grown on plantations in India and Ceylon; on these plantations very many people are employed to do the picking.

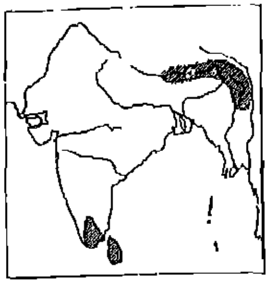


FIG. 52
Tea Plantations of India and Ceylon

The tea trees are usually allowed to grow to a height of not more than about 5 ft.; this not only makes the picking of the leaves easy, but, more important still, this pruning causes many more young, fresh, leafy shoots to grow on the tree.

The tea plant grows best on the well-drained slopes of the lower hillsides (compare this with rice growing).

Tea Planting

Let us see how the plant is actually grown. If the owner of a plantation wishes to grow more trees, he first buys or rents a suitable piece of land near his present plantations, and has it very carefully cleared, dug, and hoed. Meanwhile, he has been growing young tea plants from seed in a "nursery." When these plants are about 12 in. high, they are ready for transplantation to the newly prepared plantation. They are planted in rows about 4 ft. apart, and are carefully tended until they are 3 years old. At that age the tea plant has grown many leafy shoots, which make the best "tea."

Tea Picking and Drying

At picking time, the smaller leaves are gathered into baskets, which, when full, are taken to the factory and weighed; the pickers are paid according to the weight of leaves they pick.

The next stage in the preparation of tea is the drying process. The green leaves are taken to the factory, and placed in wire trays one above the other, with a space between each two, in order to allow the air to reach the leaves. Sometimes artificial heat is used to keep the air the correct temperature, but only when necessary.

In less than twenty-four hours the leaves are dry enough to go through the machines that *roll* the leaves into the appearance with which we are all familiar; at the same time the machines also squeeze the leaves so that any juices in them are all mixed together. The tea passes from this machine in the form of a roll of leaves pressed together. These rolled leaves next pass through a machine that breaks up the roll, and at the same time separates the finer leaves from the coarser ones

The next stage is to allow the leaves to *ferment* for a few hours; this gives the tea a better flavour. By this time the leaf is a dark brown colour, very different from its appearance when it left the tree.

When the foreman of the factory thinks that the tea has fermented long enough, it is next passed through *drying* machines, which take all the moisture out of the tea, leaving it as brittle as we see it in the packets bought in the shops.

The finished tea then passes through the machines of the sorting room; these machines *sift* the tea into its various grades according to the size of the leaf. Even the tea dust is saved and is sold under that name, or is turned into the "brick" tea so popular with the peoples of Central Asia.

Off to Market

The tea is now ready for the market. It is packed into lead-lined tea chests, and sent by rail to the nearest large port. *Calcutta* is the largest Indian tea port.

At Calcutta the tea chests are loaded on to the large steamer which is to take the tea the long journey across the ocean to London, which is the greatest tea market in the British Isles

Mincing Lane is the tea market of London The teas from India, Ceylon, and China are sold there by auction. The large tea-buying firms send their samplers and tea tasters to examine the newly arrived teas. The price they offer for the tea will depend on their opinions after seeing, smelling, and tasting it.

Of course, the tea they taste is only a sample of the whole crop recently arrived. The actual tea is stored in huge warehouses, from which it is dispatched to the respective buyers.

If the tea is bought by one of the large tea-selling firms it is sent to their factories to be wrapped in the familiar packets.

(Connect the above lesson with the lessons given in the previous years on Life in Village India, and Life on a Tea Plantation in India.)

II. *The Coffee Lands of Eastern Brazil*

A treatment similar to that of the tea plantations of China, India, or Ceylon could be used. This helps the children to remember the essential details, and to notice similarities and dissimilarities in the methods used in each industry. But great care must be taken to give only accurate details.

The particulars under the following heads should be given—

South-east Brazil grows more coffee than any other region in the world.

Type of Climate

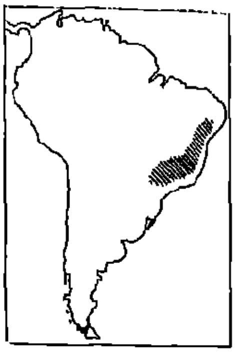
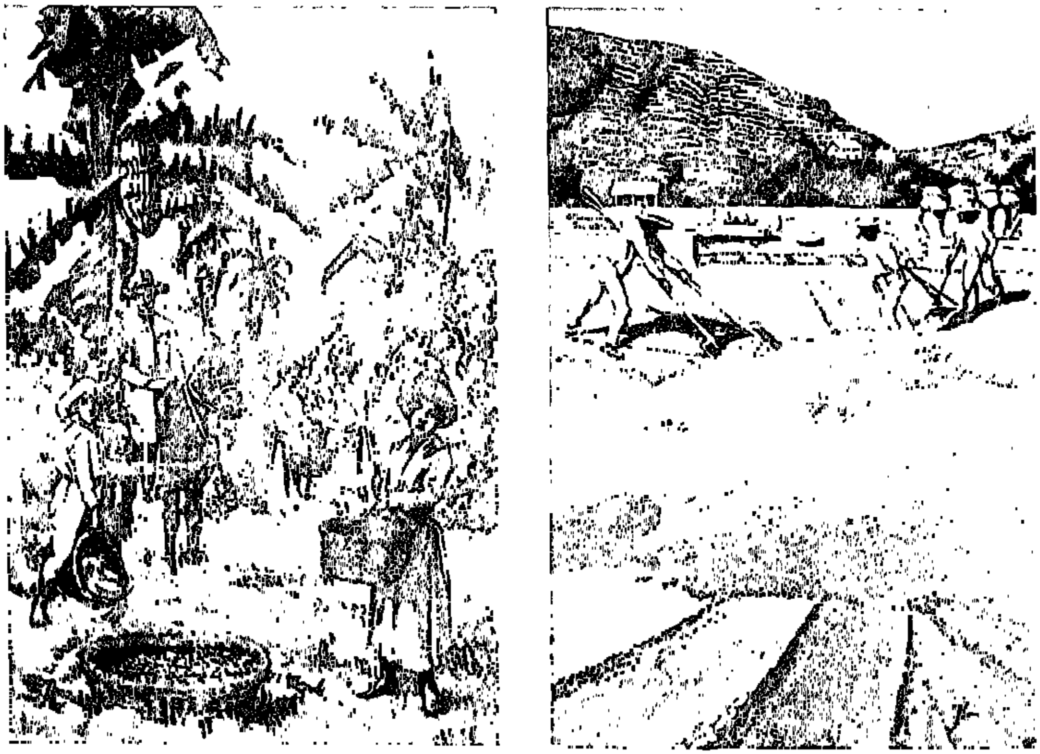


FIG. 53

Coffee-growing in East Brazil



Picking the Coffee Beans

Drying the Beans

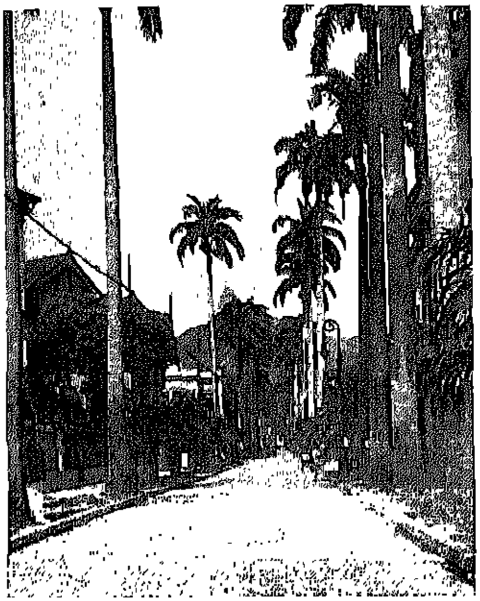
FIG 54

Life on a Coffee Plantation

Necessary. The cooler, higher lands, at the back of the hot-wet coastal lands of south-eastern Brazil.

A Description of the Plant. A shrub-like tree, pruned to about 8 ft. high. The fruit is a dark red berry, having a fleshy outer covering. The bean is the hard centre of the fruit.

The method of planting the trees in rows, with vegetable crops such as beans and maize growing between the rows. Banana trees are sometimes planted also, for the shade they give (see Fig. 54).



By courtesy of *R.M.S.P. Co.*

FIG. 55

A Quiet Road in Rio de Janeiro

(Notice the palm trees, and compare with the latitude)

The Size of the Plantations. Enormous size, where the plantation is self-sufficing, growing all its own food, with its own shops, amusements, etc.

Harvest Time. The gathering of the crop. *Note.* (1) The removing of the fleshy outer covering. (2) The open-air drying of the bean (see Fig. 54).

The processes necessary to obtain the coffee bean suitable for market overseas or at home. Machinery for skinning, grading, and packing into sacks.

Transport of the finished article to the ports by railway.

The Coffee Ports of Brazil—Santos and Rio de Janeiro. Huge warehouses.

Loading the ships—by belts and chutes.

Export to Britain and the coffee market.

What the grocer does to the coffee bean in order to make it ready for father's cup of coffee.

Note. The coffee region of Brazil is ***a single crop region,*** where the majority of the people, in the plantations, towns, and ports, have work of some kind in connection with coffee. (Note Cuba and sugar.)

III. Cocoa and Chocolate: The Cocoa Lands of West Africa

So far we have not visited Africa in our search after the origins of common things used in our own lands. Let us take a ship to West Africa, where most of the cocoa sold in our shops is obtained.

The map of the world shows that West Africa, and particularly the southern coast, is very near the Equator, where it is always very hot—in both winter and summer. There is very little difference between winter and summer. As well as great heat all the year round, very heavy rains occur at all seasons of the year, so that the yearly rainfall is very heavy. The great heat combined with heavy rain make this region—of the Guinea Coast of West Africa—one of tropical forest, where vegetation of all kinds is superabundant.

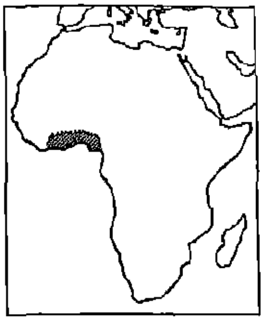


FIG. 56

Cocoa-Lands of West Africa

(Describe the tropical forest, read a description, or refer to a similar lesson in which the tropical forest was included, such as "The Rubber Lands of the Congo.")

Cocoa is obtained from the fruit of the cacao tree, which is found growing wild in the tropical forest regions of West Africa.

Not many years ago most of the cocoa used in our own lands was produced in the tropical lands of South America; to-day, West Africa provides more cocoa than any other region of the world. The British colony on the Guinea Coast, known as the Gold Coast, produces most.

The cocoa that we know is obtained from the seeds of the cacao tree. These seeds are found inside the fruit, which is a large green or red pod about 8 in. long and about 3 or 4 in. broad.

A peculiar thing about this fruit is that it grows straight from the branches and trunk of the tree.

The pods are gathered by the natives of West Africa when they are ripe, which occurs mainly from October to March. The beans are sold to the cacao merchants who are the representatives of the large cocoa and chocolate manufacturers of Britain.

The dried beans which are found inside the cacao pods are shipped to Britain from *Takoradi*, a port built by the British government. This port has good accommodation for the cocoa trade, and shelters the ships from the rough seas that occur all along this coast.

At the British Factory

The largest cocoa and chocolate factory in the world is at Bournville—a garden city—which belongs to Cadbury Brothers Ltd.

At Bournville the beans are carefully cleaned and tested for purity. They are then roasted in revolving ovens, and the outer husk is removed, leaving the bean in a broken form known as "nibs." These are passed into a grinding machine which reduces them to a liquid.

Some machines turn this into cocoa, others use it for making bars of chocolate. This chocolate is made by mixing the cocoa powder with milk and sugar, grinding all these things together until the product is perfectly smooth. Other machines mould the chocolate, cool it, and finally wrap it into "silver" paper and the outside case.

These bars or packets are then packed into wooden boxes and sent to the shopkeeper who wishes to sell them.

Hence, the history of a packet of chocolate or a tin of cocoa is very interesting, if only we are able to follow all the details from the time the pod grew on the cacao tree, on the Gold Coast, to the time when the lucky boy or girl is handed it across the shop counter in Britain.

CLOTHES

So far the course of lessons has given the child some knowledge of the various regions of the world where much of his food and drink originates. This will be increased as the researches into the origins of the familiar goods of everyday life are continued.

After food and drink, the next most intimate needs are those concerned with clothing. Hence the next few lessons could, with advantage, deal with these. The teacher should choose the regions of greatest production as far as possible, but should also keep in mind the attempt to introduce the child to as many regions of the world as possible. This should be done particularly when the main region has already been studied under another head.

I. Our Wool Supply

This suggests such lessons as—

The sheep-lands of Britain.

Wool-spinning and weaving in the Yorkshire factories.

Life on the sheep-lands of Australia.

With the exception of the factory life of the woollen towns of Yorkshire the child has already been introduced to the sheep-lands of Britain and Australia. Possibly one lesson could be very usefully taken in bringing together and revising the past knowledge and amplifying it where necessary in order that a good mental picture will be obtained of the region from which most of our wool is obtained—the sheep-lands of

Australia. In the former lesson the concentration was on these lands from the point of view of the mutton they exported. Now it will be on the production of wool, which is far more important to Australia.

II. Life on a Sheep Farm in Australia

Revise what has already been taken, add more pictures, especially those illustrating the wool aspect. Give a good description of the vast open spaces of the grasslands of Australia. Concentrate on the climatic reasons for the dryness and the consequent grass.

The thousands of sheep belonging to one sheep farmer, his outdoor life, the lives of his wife and children should all receive attention. The story *Bush Christmas* gives background details.

Lambing time, branding time, dipping time, and shearing time are the most important professional matters to the farmer. Each should be described. Note the time that must be spent on horseback, and the value of the sheepdog. To-day, however, cars and lorries are being used more and more in the sheep country, so that the isolation of the farms is not so complete.

Point out the emptiness of the country in terms of population, so that a sheep farmer could ride or drive for many miles without meeting any one and without seeing a house.

Shearing Time

Many of the sheep farmers of Australia rear sheep mainly for the wool. Hence, in more ways than one, the shearing time is a very important season, for on the product depends the livelihood of the man. The sheep are rounded up, and pass to the shearing sheds. The sheep are so numerous that in a really large station they are sheared by machinery run by electricity. Two or three weeks before the sheep are sheared they receive a very thorough washing. This saves much labour after shearing, for the wool has grown very long, matted, and dirty. It is much better to get rid of some of the dirt *before* the shearing, otherwise the wool would get more matted.

Sheep Washing

In Britain the sheep are usually washed in May. This is done by driving the sheep into a specially prepared stream of running water. The sheep are forced to swim up stream, while men on the banks push them under water from time to time, by means of a long pole. In this way the whole of the wool on the sheep's back receives a good soaking, that helps to unmat the wool and remove much of the dirt that it has gathered during the winter.

In Australia, this method would take too long in order to clean the thousands of sheep that each sheep farmer possesses. So a washing machine is installed on the farm. By means of this machine the sheep receive two or three baths in either hot or cold water. The water is pumped from the neighbouring stream to what are known as *the washing yards*.

Usually there are four washing yards through which a sheep has to pass. The first gives it a good spraying, the next forces it into a tank in which it must swim; the third consists of the washing tank in which each sheep receives a good cleansing; while the last is another swimming tank. By the time the sheep have passed through all these washings their fleeces are ever so much cleaner than they were before.

The water has taken much of the natural oil and gloss out of the fleece, so the shearing does not take place until two or three weeks after the washing.

After the Shearing

The shearer is careful not to hurt the sheep, and cuts off the fleece very carefully, so that it is kept whole. The fleeces are sorted out, and are packed together into bales according to their grade.

In Australia the bales of fleeces are sent on carts or lorries (where the roads are good enough for mechanical transport) to the nearest railway station. From there they go to the nearest port. Notice the main ports and the three largest towns and ports of Australia, namely Brisbane, Sydney, and Melbourne. Notice their connections with the sheep-lands.

The Journey Across the Seas to Britain

This might be a convenient time to take the main routes from Australia to Britain. The Suez route and the Cape route could both be taken, and a general description be given of the voyage and the countries on the way.

The London Docks

Eventually the ship, after its voyage half-way round the world, reaches London. (Note the change in season, but do not try to give the explanation to young children. It will be sufficient to make the statement that while it is summer time in Australia, on the other side of the earth, it is winter time in our own lands.)

Describe the London Docks, with treasures from all parts of the world (the origins of some of which have already been studied).

Off to the Wool Factory

The next journey of the fleece is to the wool factory, after it has been bought by the wool manufacturer.

At this point, the class should be introduced to the British region that specializes in the manufacture of woollen goods—the West Riding of Yorkshire. (The reasons for this specialization in that particular region need not be taken until the next year's course on the geography of the British Isles.)

Preparing the Wool for Manufacture

Before the wool is ready for the spinner it must go through many processes. These should be referred to by the teacher, but care must be taken that the child does not miss seeing "the wood for the trees" if too much detail is taken.

Wool Sorting and *Wool Washing.* The dirty fleece fresh from the bale is taken to the sorting room, where it is placed on a long bench, and divided up into the different qualities of wool in it. Every fleece contains more than a dozen different grades of wool, according to the part of the body it came from.

After the fleece has been divided up in this way, it goes next to the washing room. There it is thoroughly scoured by washing machinery, which treats it in such a way that the fibres are not matted. It is usually so dirty that it comes out of the washing room less than half the weight it was when it entered.

Drying and Teasing are the next two processes. The wool is dried in a hot drying room, where it is spread thinly on the floor, and carefully raked over. It is usually passed through a drying machine. Then it passes through a machine that unravels the tangled fibres. This is the teasing machine.

Another machine picks out any seeds, burrs, or other foreign material that the fleece collected when it was on the sheep's back.

By the end of all these sorting, washing, teasing, and burring processes the wool is very dry—too dry to be spun. Hence it must first be sprayed with oil, olive oil being the best for this purpose.

Carding and combing are the next processes, whereby the fibres of the wool are so clearly separated from each other that the spinning machine can do its work properly. Wonderful machines do these two operations, which disentangle further, straighten, arrange, and sort.

The result of all the above operations is the *sliver* of wool, which looks like a white rope made up of millions of fibres all going the same way.

Spinning and Weaving

These are the two topics usually concentrated upon in any account of the wool industry. The details need not be given here, but they must certainly be given to the children. The most important two things that the child should thoroughly grasp are what spinning does (makes a thread), and how these threads are turned into a piece of cloth.

Both the above processes will be best understood if the child is allowed to unravel a single thread from a piece of cloth, and is told to study carefully, and describe how a piece of coarse cloth is made by threads being passed under one and over the other alternately (see Vol. V, "Rug Making").

The History of Spinning and Weaving

A short chat on these will help the young child to appreciate the wonderful machines of to-day, each of which, with only one minder, can do the work of thousands of hand-workers in less time and more efficiently.

Spinning. First the distaff and spindle could be described, then the invention of the spinning wheel, and finally the spinning jenny of Hargreaves, named after his wife.

Weaving. This, like spinning, was practised from very early times. It consists of the *warp* and the *weft* or *woof*, woven at right angles to each other. All that is required is a frame with threads tied long-ways to it; this forms the warp. All the weaver has to do then is to pass the weft under and over alternate threads of the warp. Thus a piece of cloth could be made.

Modern Spinning and Weaving. Pictures of the wonderful machines in the Yorkshire factories could be shown, and a simple explanation given of their working.

The Wool Industry

The reasons for the localization of the industry will be more fully taken in the next year of the course. Here, the teacher should let the children find out the general position of the wool towns on the map, and then give a general chat on their position with regard to the Pennines, the Yorkshire coalfield, and the port of Hull.

The names and position of Bradford and Leeds will be sufficient name knowledge at this stage, unless the children are living in the West Riding.

III. Cotton Growing and the Cotton Industry

The obvious lessons in connection with our cotton needs are—

Life on the Cotton Plantations of the Southern States of the U.S.A.

A Visit to the Cotton Mills of Lancashire. It is likely that the first item has already been given in the previous course. Hence, the particulars should be revised, amplified, and made more definite geographically.

Also, the cotton industry of Lancashire will be dealt with in the course on the British Isles, next year; and many of the details of spinning and weaving (especially historically) are very similar to those of the wool industry, which was taken in the last lesson.

Hence, one method of taking "cotton" at this stage would be to make one unit of study of all the above, tracing the product from the cotton fields to the consumer.

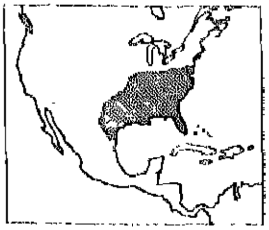


FIG. 57
Southern States, U.S.A. Cotton

Some suggested headings to be discussed are—

What Cotton is.

Where it Grows. (Note attempts to grow it on a large scale in the British Commonwealth, e.g. India, the Sudan, West Africa, etc.)

Method of Picking. Negroes. Baskets.

Ginning. The uses of the seeds.

Packing into Bales. Transport to the ports.

Loading of the Cotton Ships.

The Voyage across the Atlantic Ocean.

Arrival at Liverpool and then on to Manchester by way of the Manchester Ship Canal.

Manchester the depot for distribution and collection of the finished article.

The Cotton Spinning Towns, and what is done in the spinning factories.

The Cotton Weaving Towns, and what is done in the weaving factories.

By some such method as the above the child will receive a good general notion of the production of cotton cloth from the raw material to the making of a piece of cotton cloth.

But the process should be continued briefly, until the cotton shirt or the cotton frock is reached.

Projects. The above sounds more like a survey of the industry for a student of economics, and the processes seem too difficult to be explained to a child under 10 years. Yet children of that age should receive their introduction to geography through such things and by such methods. How is the teacher to get over the difficulty?

One answer is by means of pictures. Not just a picture here and there, but by pictures illustrating each of the above points. Let the pictures be placed in their right sequence, and with a word of explanation of each and a connecting thread showing the gradual evolution of the cotton, the teacher's work has been very successfully done.

If a project is carefully planned by the teacher, with models, pictures, looms, material, etc., and the children use reference books and make their own illustrated books, there will be real achievement.

IV. Silk

Suggested topics are—

The Silk Industry of China or Japan.
The Artificial Silk Industry of England.

The above could be combined into one lesson that deals mainly with the production of real silk (an animal product); the lesson should conclude with a talk on the rise and importance of the manufacture of artificial silk and nylon in the twentieth century, as illustrating the continual inventive powers of mankind.

The Silk Industry of China or Japan

The teacher should use his discretion as to which country he takes. It might be better to take China, as there was a danger in the previous lessons on that important country that the child might have received the idea that all the Chinese are poor peasants who earn their livings in the rice fields and are very primitive.

The Chinese have been making cotton, woollen, and silk goods for centuries, and used simple machines for spinning and weaving long before they were thought of (or copied) in our own lands.

Silkworms and Cocoons

If silkworms have been reared for the purpose of the Nature lessons, then the work of the teacher at this stage will be simplified.

Silk is obtained from a caterpillar usually called the silk *worm*. It grew from the tiny egg of the silk moth. When the caterpillar is full grown it exudes a tiny thread of silk from tiny holes under its jaws, and binds this round and round itself until a cocoon is formed. In doing this it might be said that it kills itself, but only in order to bring forth something quite different —the moth, which in its turn will lay eggs. Thus the life cycle of the creature is evolved.

But the people interested in obtaining silk do not allow the life cycle to be completed. The cocoons are taken, and the animal silk is carefully unwound from the cocoons.

Why Natural Silk is Obtained from China and Japan

Silkworms do not flourish everywhere. They flourish best on the leaves of the mulberry tree, and this tree grows best in fairly warm countries. Countries that produce much natural silk are China and Japan, and the countries of the Mediterranean Sea, such as the south of France. In all these countries the mulberry tree flourishes.

Rearing Silkworms

The countries that produce much silk do not let these creatures grow in their natural state. They look after them very carefully, just as carefully as the British cattle farmer looks after his cattle.

After the eggs are laid by the moth, they are collected and placed on shallow trays covered with clean white paper. Numbers of these trays are placed one above the other in a specially prepared box, called an incubator. In these incubators the eggs are kept at a particular temperature for nearly a year.

At last the tiny caterpillar (about a tenth of an inch) emerges from the egg, and begins to eat most voraciously. It eats so much that in four days it seems to have nearly killed itself, for it lies down as if dead. But the silkworm has simply found that it is too large for its skin, so it wriggles out of it, and starts eating again as hard as ever.

It changes its skin in this way five times altogether during its five weeks of life and growth. At the end of that time it is about 3 in. long, and knows that the time has arrived for it to spin its cocoon.

All this time the careful rearers of the caterpillars have been watching their progress, and seeing not only that they have plenty to eat, but also that they are kept at the correct temperature.

When the creature is ready to begin spinning its cocoon the silk farmers carefully place it on suitable spots. There the caterpillar begins to wind itself round with the natural silk thread that it exudes from its body. In a very wonderful way this liquid material of tiny threads, which hardens as it gets to the air, is wound round the body *from the outside* to the inside. Altogether about 400 yd. of fine silk thread are wound round each caterpillar.

When the winding is complete, the creature is known as a *chrysalis*. If not interfered with, in three weeks a silk moth would eat its way out of the chrysalis; but the silk farmer has other plans for the chrysalis.

Obtaining the Silk

The cocoons when finished are sorted, and are placed in steam for about a quarter of an hour. By that time any life inside the cocoon is destroyed.

The cocoon is now almost ready to give up its silk threads, but first the dead creature is got rid of, by means of a machine that beats out the remains of it in the form of dust.

The Reeling of the Silk is the most important operation. Formerly this was done by hand, the end of the silk being obtained and the whole of the silk gradually being unwound.

To-day this is done by machinery, which has to be operated by very delicate fingers. In the process a number of threads are reeled together, as a single silk thread is so extremely thin and delicate, like that of a spider's web, that it would be almost impossible to wind it.

The silk is thus wound on to reels. When the reel is full the silk is taken off and sent as "hanks" of silk to the silk factory.

The Spinning Machine

Although the silk is, in the first place, spun naturally by the silkworm, and is again joined with other threads by the reeling machine, yet it is still so slender and fragile that it must be spun into a thicker thread. This is done by a machine that could be likened to the machine that spins cotton thread, only it is a more delicate operation.

The hanks of silk are still very gummy looking, and do not have the beautiful lustre that belongs to the silk cloth with which we are familiar.

FIG. 58
A Japanese Lady

Hence the silk must next receive a good washing in scouring machines. After being dried it is a clean pearly white colour, and it is then practically ready for the silk weaver, who will turn these silk threads into beautiful silk cloths from which so many delightful things can be made.

Conclusion. Some of the other processes could be mentioned in order to give a complete picture (to a child) of the wonders of the manufacture of silk. The teacher could conclude by a talk on the silk industry as operated in England, as at Macclesfield, and at Spitalfields in London.

The Artificial Silk Industry

A great change has taken place in the world's silk industry during the last forty years or so. Formerly silk was very dear, and real silk is still very expensive. How is it, then, that so many silk things can be bought in the shops to-day very cheaply? It is because inventors have found out how to make silk artificially—in various ways. From wood pulp and certain chemicals for instance, a liquid is obtained that is very similar to the material exuded by the silkworm when it is making its cocoon. To turn this liquid into a thread it is blown through a very small hole, and allowed to harden.

Hence it is quite possible that, in the future, less and less millions of silkworms will be scalded to death in order to provide beautiful silk articles of dress and other things.

SHELTER

The suggestions above for lessons on the origin of our food and clothing show how the course could be continued to include the items under "shelter."

As space is scarce it is not intended to go into the detail of such lessons here. A list of suggested lessons is to be found on page 386.

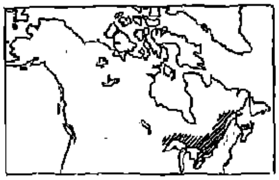


FIG. 59

Lumbering and Paper Industry in Canada

As many of the items under the heading occur either in the work of the former years or in the work on the British Isles next year, a good plan would be to give one or two general lessons, which gather up the information already given, and lead up to what will be given in the next year. In other words, make the question of different types of homes the topic for one or two lessons.

Pictures

It is best dealt with by means of pictures and talks explaining the geographical reasons for the use of certain materials in certain regions.

For example, pictures of the following should be shown if possible: *Brick* houses of many towns; *slate* roofs; *stone* houses of many parts of Scotland and northern England; *timbered* houses with bricks, stone, etc., as in Surrey and places where timber is or was plentiful; *thatched* roofs in rural districts; Portland stone and granite of Hampshire, etc., and Scotland respectively; and so on, according to the pictures that are available to each teacher.

Such lessons will extend the child's ideas geographically in terms of the use that is made of local materials in our own lands, in the same way as has been done in the studies of more primitive communities in other parts of the world.

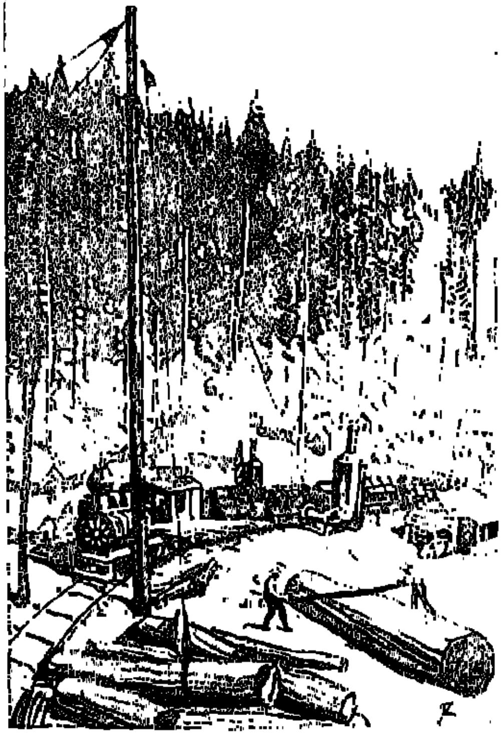


FIG. 60

A Scene in a Lumber Camp

(*Note the forest, the shacks, the method of lifting the heavy logs, and the railway that transports some of the timber*)

EXTENSION OF THE COURSE

Lessons summarizing the Geography of our Food, our Clothing, and our Shelter should be given at the conclusion of the course.

This should systematically gather up the information received during the lessons, and make a unity of them. Possibly one of the best methods of doing this would be to start with a fresh, large blank map of the world, and to shade the regions concerned as they are mentioned. This, with a bright talk, with many questions, on each product and the region from which it is obtained should do much to make the course of lasting value.

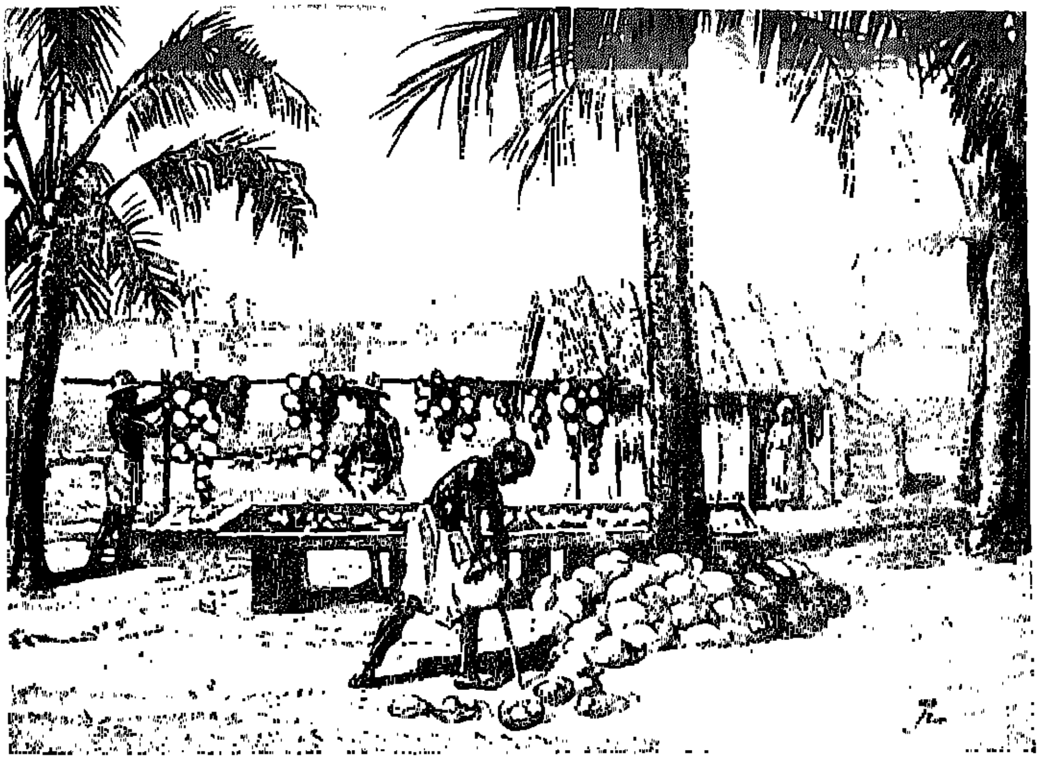


FIG. 61

Preparing Copra on a Coral Island in the Pacific Ocean

(Copra is the dried flesh of the coco-nut, from which soap and margarine are prepared)

Other Important Familiar Things

If the teacher has time, and if he has been able to make the children enthusiastic in the above type of work (and this all depends on the method of approach), other regions of the world might be taken, in tracing to their origin other familiar things of everyday life. Five or six such lessons are suggested on page 387.

Where the teacher finds that the region or product has already been studied, revise the item in terms of the origins of familiar things, and try to let the children see something of the intricate organization required, and the many workers that are employed, in supplying these wants—such as farmer, labourer, transport workers (road, rail, canal, steamer); also, the many different trades in connection with the manufacture of the articles should be considered. The shopkeeper and the clerical worker should not be ignored.

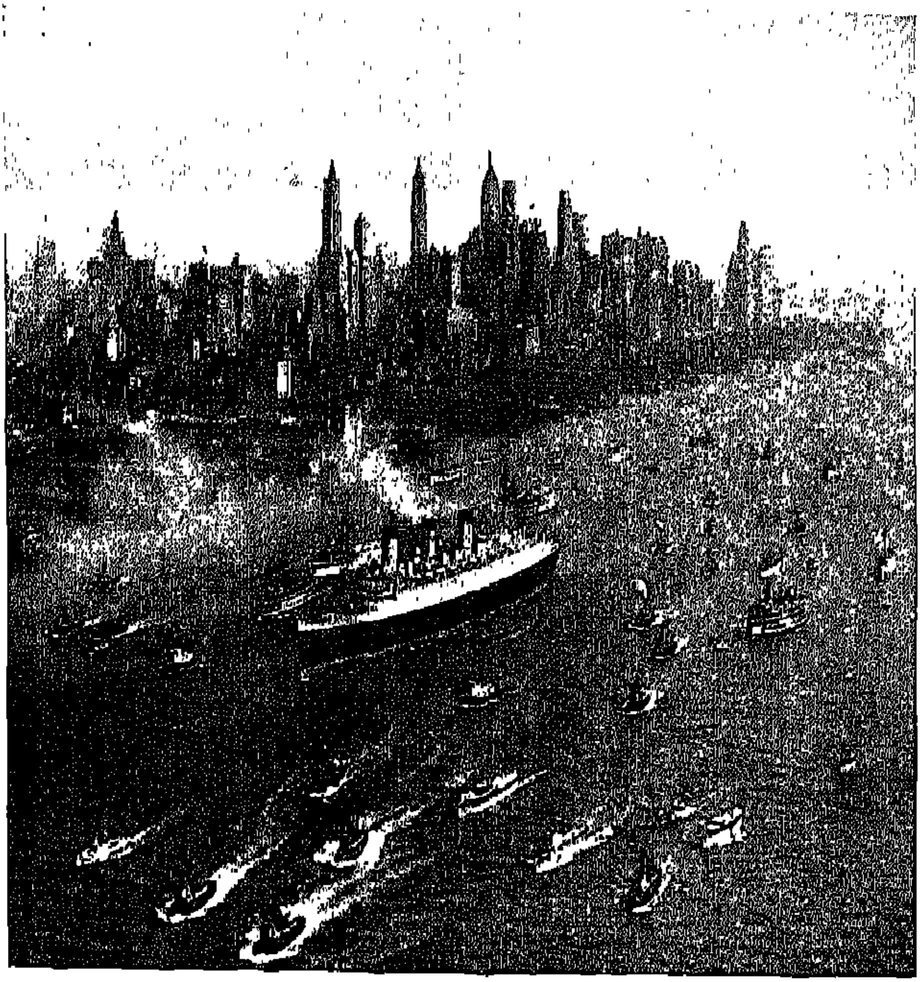


FIG. 62

R.M.S. Queen Mary

THE BRITISH ISLES—OUR OWN LANDS

THE last year of the Junior School geography course should deal with the British Isles. Some "home geography" will have been taken during the previous years, and during such lessons the child will have received some ideas of what a map means.

Such ideas of maps may have been obtained by the attempt to make, in the following order of production, such plans as—

The classroom,
The school playground,
The school buildings and playground,
The school surroundings, including the school,

and so on, until a map could be made including practically all the local environment within the child's experience.

These maps should be *rough* sketches done by the child, but he should be shown a perfect map of the same region, after his attempt, and so learn to read what the map has to tell him.

Large-scale maps of other regions can be introduced, and understood most easily, by showing the child airplane views of typical regions side by side with a map drawn on the same scale. This is most easily appreciated by using an air view showing the streets of part of a large town—if possible, a town with which the child is familiar.

Human Geography

During the previous years in the Junior School the geography lessons should have shown the world divided up broadly into the major "Natural Regions," in each of which the people live as they do (in terms of food, clothing, and shelter) and earn their livings in a particular way because of the physical (including the climatic) conditions in that region.

The teacher will also have emphasized the value to *all* of the interchange of the produce of the peoples of any one region, and later the exchange of products between the peoples of different regions. In other words, the advantages of a natural division of labour between peoples and regions will have been appreciated in an elementary way.

In the lessons on the origins of the common things of everyday life it was seen that Our Own Lands draw on other countries for many of our daily necessities. Wheat from Canada, rice from Burma, beef from Argentina, mutton from New Zealand, tea from Ceylon, coffee from Brazil, cocoa from West Africa, fruits from the regions of Mediterranean climate, including South Africa, South Australia, and California, cotton from the U.S.A. and Egypt, wool from Australia, silk from China, petrol from the U.S.A. and Mexico, rubber from the Malay States, and a hundred other things could be quoted (a splendid method of revising world geography).

The obvious question to the thoughtful young student in the Junior School is: What do we do or give in return for all these various goods, many of which we could not produce in Our Own Lands?

Hence the need for studying more closely what the people in Our Own Lands do to earn their livings, and so pay for the produce received from other countries.

A list of the various occupations can be quickly obtained from most children at this age, and could be generalized under the heads already familiar to the children in their lessons on other lands. For example—

I. PEOPLE LIVING AND WORKING ON THE LAND

(*a*) *Farmers growing food*

= Arable land
1. Wheat, barley, oats, etc.
2. Vegetables of all kinds.
3. Fruit—apples, pears, plums.

(*b*) *Farmers rearing food*

= Pasture land
1. Cattle for beef or dairy produce—milk, butter, cheese.
2. Sheep for mutton.
3. Pigs for pork or bacon.

II. PEOPLE LIVING IN TOWNS OR WORKING IN FACTORIES
= The makers of things = the manufacturers, or those who help the manufacture.

[illegible] of the more important industries could be obtained from the class. For the purposes of the Junior School, the geographical teaching should be limited to the basic industries such as—

(a) The manufacturers of iron and steel.
(b) The manufacturers of iron and steel goods.
(c) The manufacturers of cotton goods.
(d) The manufacturers of woollen goods.
(e) The manufacturers of leather and leather goods.
(f) The manufacturers of an important local industry.

III. THE MINERS—particularly of *Coal*.

The importance of coal to our manufactures should be emphasized when lessons on any large industry are given.

IV. THE FISHERMEN AND SAILORS. The Men of the Sea.

V. THE BUILDERS—of houses, factories, buildings, etc.

VI. THE TRADERS AND SHOPKEEPERS of all kinds.

VII. OTHER WORKERS not so obviously producing "goods," e.g. domestic workers, clerks, postmen, policemen, doctors, teachers, etc.

If the above list is placed on the blackboard as the children give the information (the teacher arranging the items under the headings), the children will be given a broad outline of the human geography they are about to tackle during their last years in the Junior School.

The list will be more valuable if the children are allowed to make careful copies, to keep in their notebooks or loose-leaf cases. Another list printed on a large piece of cardboard could be periodically referred to as the course proceeds.

The children will understand from these introductory talks that their geography lessons are going to be very real, for they will be told that their future lessons will concern all the above workers in Our Own Lands, and will show where certain occupations tend to concentrate, and the suitability or otherwise of any one region for any particular kind of work.

This method makes an interesting introduction to the Human and Regional Geography of the British Isles; it should be referred to throughout the course. The children then realize from the beginning what their lessons are aiming at. It helps them to see their studies as a whole, rather than as disconnected masses of "information."

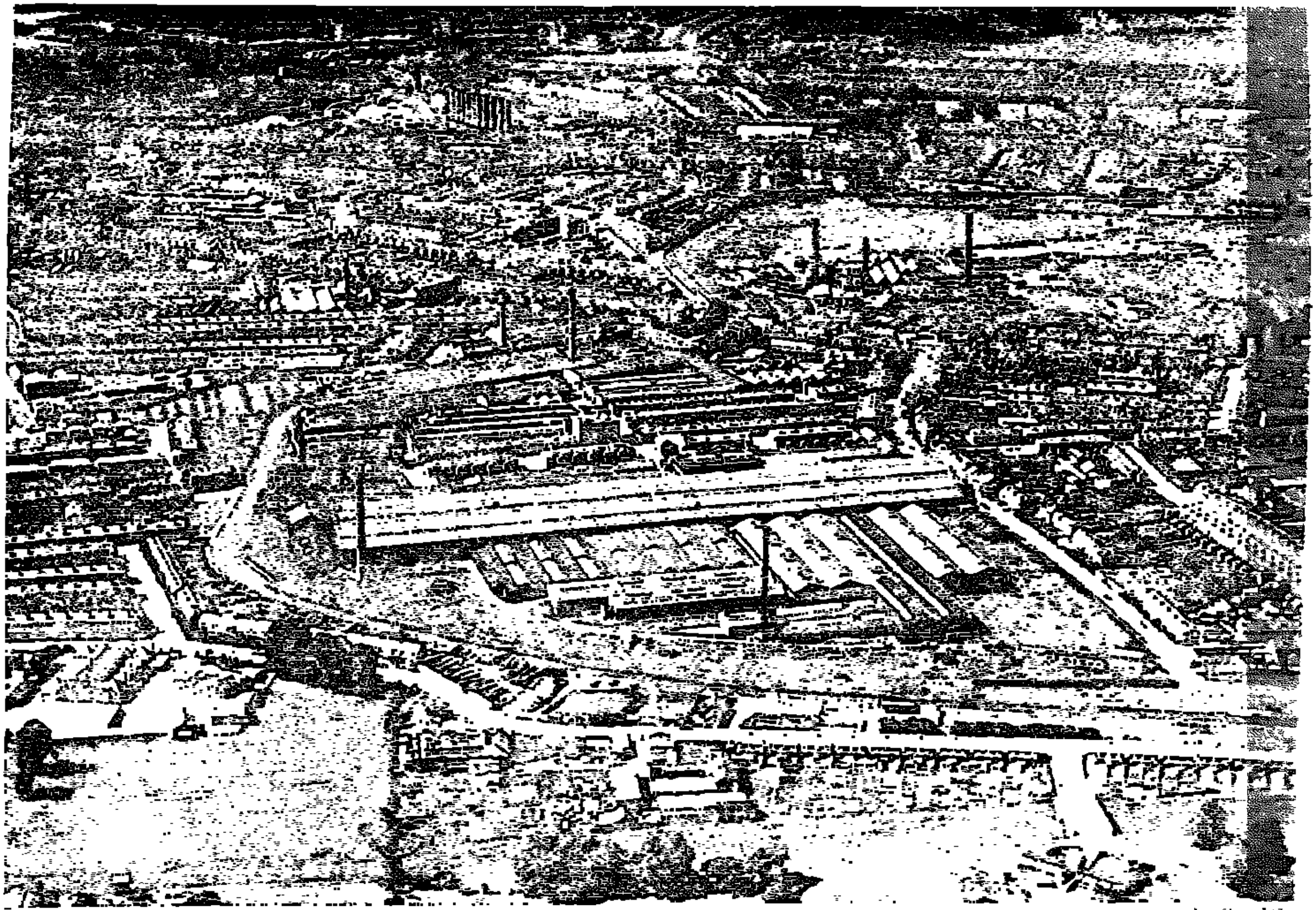
Place Knowledge

At this point the children should begin to obtain some framework of place knowledge of the British Isles as a whole. Much of this can be done by means of a few minutes' "drill" at the beginning of each lesson.

With regard to this a criticism of the so-called "new" geography is that, although the children become very interested and receive a heterogeneous knowledge of many things, at the end of the course they usually seem to be extremely ignorant of essential place knowledge

If this is true, then the geography teacher is to blame, and not the "new" geography. Of course, children should know the map thoroughly and should be able to point out regions and places immediately. But this should not become the *aim* of the lessons—but simply the background of knowledge necessary to appreciate thoroughly the real geography.

Let the teacher make up his mind, at the beginning of the course, what place knowledge he expects the children to have, and then give them periodic "place drill"—a few minutes each lesson should suffice. A few minutes *before* the lesson is valuable in introducing *new* places to the children, but they should be places the teacher will mention in the lesson which is to follow.



Photograph by Aerofilms, Ltd

FIG. 63

An Air View of Coventry, the Centre of the Motor Industry

(The city was heavily damaged in the famous air raid of 1940, but amazing initiative was shown in rebuilding and re-establishing the industry)

THE BRITISH ISLES AS A UNIT

The introductory lesson or lessons on "The Work of the People of Our Own Lands" having been given, the children should come into more intimate contact with the British Isles as a unit.

This should be done fairly rapidly by means of wall maps and atlases. The aim is to give a broad foundation of the British Isles as a whole, on which the future studies of the regional geography can be more securely based.

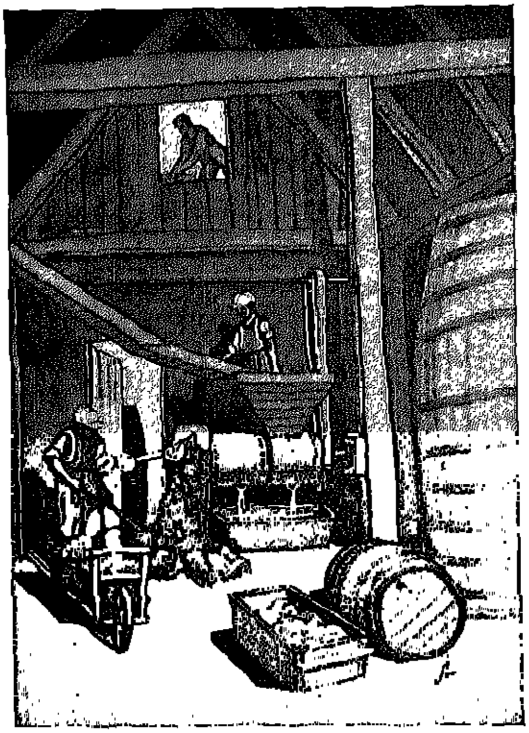


FIG 64
How Devonshire Cider is made

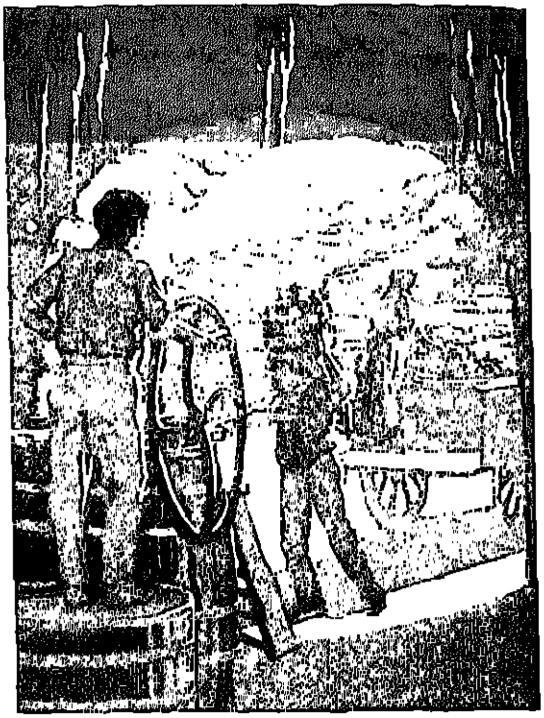


FIG. 65
Taking the Grapes to the Press in a French Vineyard

OUR OWN LANDS

1. What the map of the British Isles tells us.
2. The component parts—England, Scotland, Wales, and Northern Ireland; and, for geographical purposes, the Republic of Eire.
3. The relative position of each of these countries to the others.
4. The nearness to Europe—France, Belgium, etc., the North Sea.
5. The surrounding seas. "Set in the Silver Sea." The benefits of this for a trading country.

Note. At this stage the teacher could interpolate other place facts, the knowledge of which would save time later. For example, the positions of the six or seven most important towns in the British Isles could be located by the children from their atlases—London, Liverpool, Birmingham, Glasgow, Edinburgh, Cardiff, Belfast, Dublin—and a few words given about each.

In other words, give a little place drill right from the beginning.

The Position of the Highlands and the Lowlands

It should be pointed out to the children that the position of the highlands and lowlands of any country often gives a keynote to the more important regions. In most countries the inhabitants tend to live on the lowlands rather than on the highlands. They may do this for many reasons, the most important of which may be summarized as follows—

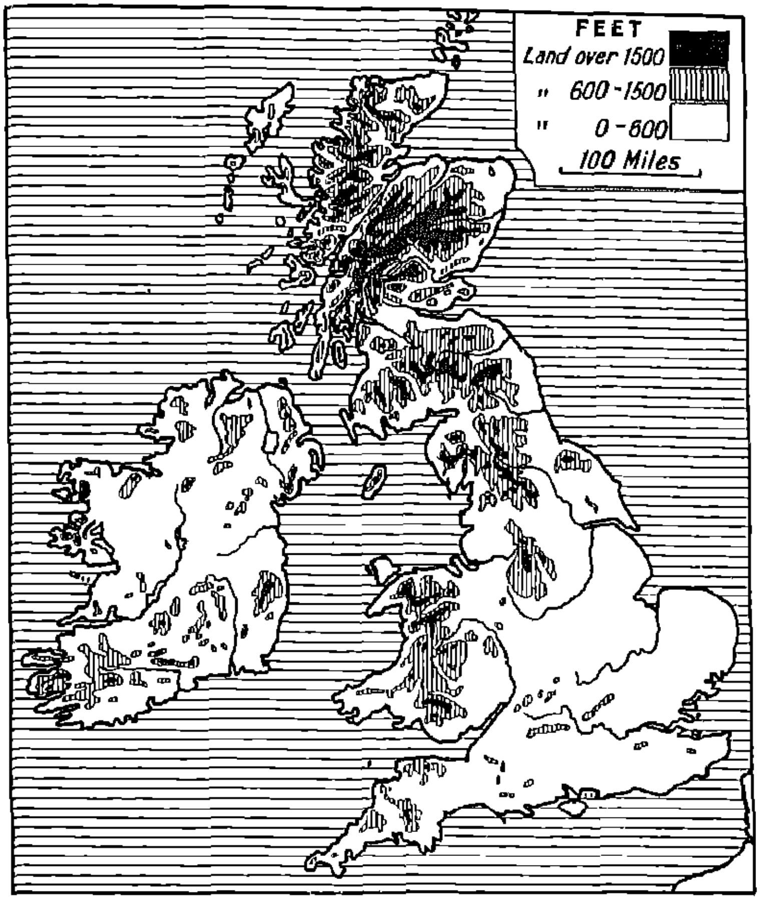


Fig. 66

Highlands and Lowlands of the British Isles

1. More easily cultivated, because usually more fertile.
2. Movement of all kinds on land is easier, and transport is cheaper.
3. The water supply is more easily obtained from the rivers—both for drinking purposes and for crops.

The above facts are particularly true for lands in temperate regions. Hence the lowlands of the British Isles are usually more important than the highlands.

The highest lands, called "mountains," are of little use, unless valuable minerals are present in the rocks.

Now notice the position and names of the regions of highland, as this will help us to remember better the position of the lowlands.

(The teacher should treat the highlands as areas rather than ranges; and any maps drawn by the teacher or pupil should usually show highlands as areas to be shaded or coloured; the old practice of drawing a broad line for mountains should be avoided when possible, as it gives the young child the wrong idea concerning the higher lands on the earth's surface.)

The main points the children should notice with regard to the highlands of the British Isles are the following—

1. The mass of Welsh mountains—Snowdon the highest point.
2. The Pennine mass running into the
3. Southern Uplands of Scotland.
4. The Scottish Highlands split in two by the Caledonian Canal.
5. The general arrangement of broken high land round the coast of Ireland.

The above "high" lands outline the following more important "low" lands, the human geography of which will be studied later in greater detail.

1. *The English Plain*

This occupies most of the region south and east of a line drawn from the Tees to the Severn mouth. Notice—

1. The lines of hills crossing this plain from north-east to south-west (sheep).
2. The lowlands of Eastern England, and how they face a corresponding lowland on the other side of the Channel. Note the position of London.
3. The lowlands of Central England—round the base of the Pennines.
4. The lowlands of Western England—Lancashire, Cheshire, the Midland Gate, and the Severn Plain.

The above can be amplified and "driven home" *after* they have been pointed out, by tracing the main rivers that flow through each region. The rivers Thames, Severn, Yorkshire Ouse, Trent, Great Ouse, Mersey, and Dee should receive most attention. Let the children follow their courses from source to mouth, noticing the names of towns on their banks. (All this kind of work helps them in their later studies, when they are expected to know where places are.)

2. *The Scottish Plains*

1. *The Rift Valley of Scotland* is by far the most important, and should receive most attention. It could be stated straight off that this is the most important region of Scotland, where most of the people in Scotland live, and where the largest towns are situated, and where most work is done in factories. Notice the rivers Clyde, Forth, and Tay.
2. *The Eastern Lowlands* of the Aberdeen region.

3. *The Central Plain of Ireland*

Compare the situation of this plain with the situations of the English and Scottish plains. Notice the many rivers, and the names of the larger and more important ones.

Mention at this point that Northern Ireland and Eire are agricultural, and give the children a general idea of products. Mention also the lack of coal. (The idea of these "tit-bits" of information at certain points is not only to whet the child's appetite, but more particularly to prepare him a little for the detailed studies, in which some of the reasons for the existing conditions will be traced. It is a case of preparing the way all through the course for something more later; but it must be done unobtrusively in the preliminary stages.)

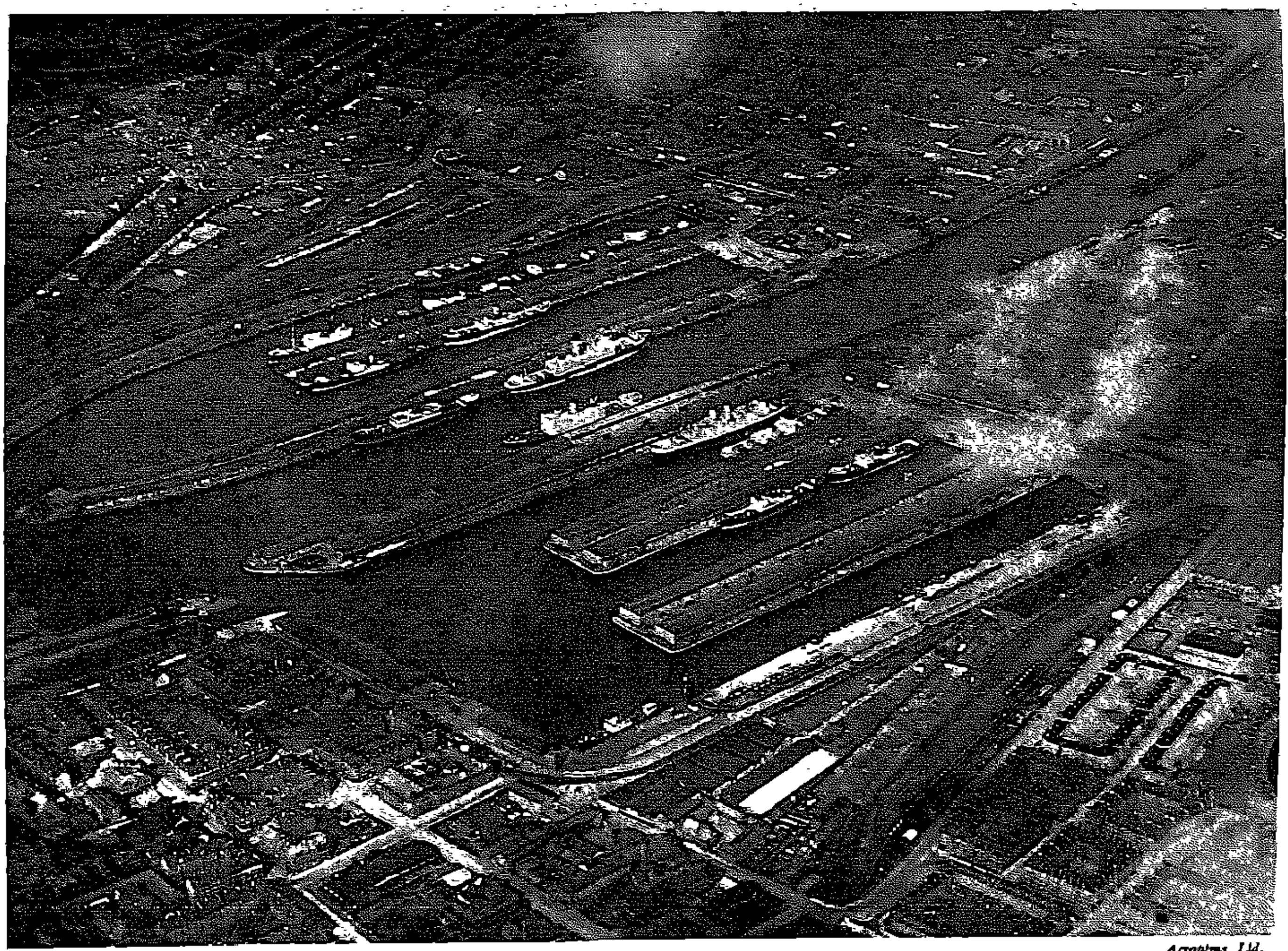
4. *The Welsh Lowlands*

The children will have to look closely at the map for these; that is why it is better to leave the Welsh lowlands until the others have been studied.

The main lowlands are—

1. Those on the eastern borders of Wales joining with the English plain.
2. The river valleys that form an extension of the above plain, and reach into the Welsh hills.
3. The northern coast plain—very narrow.
4. The southern coast plain.

This is a good opportunity to talk of the use



Photograph by Aerofilms, Ltd.

FIG. 67

An Air View of Glasgow Docks

made of the river valleys and the narrow coastal plains as the best routes into, and out of, the country. Connect with the history of the attempts of England to conquer Wales, and the raids of each country on the other.

In this connection, let the children follow the railway routes from England into Wales by each of the above lowlands. This emphasizes the importance of the lowlands in terms of ease of transport.

A survey similar to the above makes a good background to the future regional studies, as well as giving the children a few elementary "ideas" of geographical value, that will be expanded in later lessons—and possibly completed in the Secondary School.

THE WEATHER AND CLIMATE OF OUR OWN LANDS

This should be treated in a broad way, similar to the method used in studying the Highlands and the Lowlands. Before the detailed studies of the more important regions of the British Isles are taken with the children, it is a great help to the teacher to know that the class has a certain background of knowledge, and what that knowledge is.

If such preliminary lessons on the weather and climate of the British Isles as a whole are not given, the child finds it more difficult to understand and remember the facts attached to the many different regions to which he is introduced later.

On the other hand, such preliminary lessons on the British Isles as a unit help him later to see how each region fits into the whole. This is easier than taking each region first and joining them all together at the end of the course to make a unit.

The best method is to take the whole as a unit at the beginning of the course, then to take the individual regions, and, finally, at the end of the course, to build the regions up together to form a whole once again, with the aid of the increased knowledge obtained in the regional studies.

Weather and Climate

The difference between these two things should be understood by the class in an elementary way. The weather of any place is what is occurring there at a particular moment of time. The climate, however, is the generalized conditions that have occurred over a particular *period* of time—usually a whole season, or the average conditions of the same season over a period of many years.

The children will quickly appreciate this if they have been taking regular weather records in connection with the science or home geography lessons. Hence the geography lesson will concern *climate* rather than weather.

What do we Mean by the Climate of a Region?

We mean the average conditions during the various seasons in terms of the heat or cold of the region, the amount of rain received by the region, at what season of the year the rain occurred, and whether it occurred at all seasons.

For school purposes the temperature and rainfall conditions for winter and summer are all that are required to give the children the necessary ideas. For Juniors it will be better to give them *qualitative*, not quantitative, statements.

The Average Temperatures Occurring in the British Isles in Winter and in Summer

All that is required for the Junior School is the information given on the two maps (Figs. 68 and 69). Notice the qualitative statements on these maps.

The children should mark the given regions on blank maps of the British Isles, and keep them for future reference.

They should notice the positions of the following in Fig. 69—

1. The hottest areas in summer, viz. the London region and the south of England.
2. The coolest areas in summer, viz., the north of Scotland.

Notice also that the south is the hottest in summer, and it becomes cooler and cooler the farther north one goes.

(Which coast is likely to have the nicest bathing and paddling during the summer months? Which coast is most likely to have the hottest weather during a week's holiday? Why is the London region hotter than the south coast during many summer days?)

Now let us turn to the map showing the *coldest and warmest places in the winter months.*

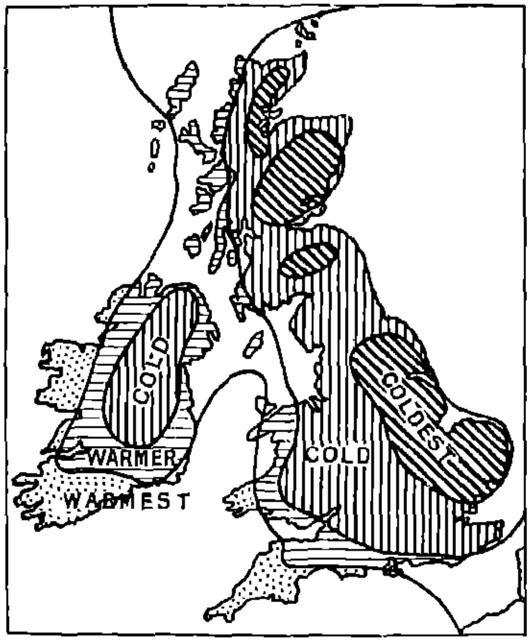


FIG. 68

Coldest and Warmest Regions in January

The children should notice the following areas on the temperature map for the *winter months* (this could be called the "Heat and Cold" map for winter time)—

1. The coldest areas in winter: viz. the eastern part of the English plain; and eastern Scotland.

2. The warmest areas in winter: viz. the west of Ireland, and south-west of Britain (Cornwall and Devon).

This raises an interesting point, for the coldest and warmest places in the British Isles in winter run from east to west, and not from north to south as they did in the map showing the summer conditions. Why is this?

The Gulf Stream

This question introduces quite naturally, not only the facts about the Gulf Stream, but also the facts about the prevailing winds of the British Isles.

The teacher should be careful at this point to give the children correct ideas on the effects of these two phenomena. But the most important thing is to give the children the results of the phenomena, rather than to go into too scientific explanations.

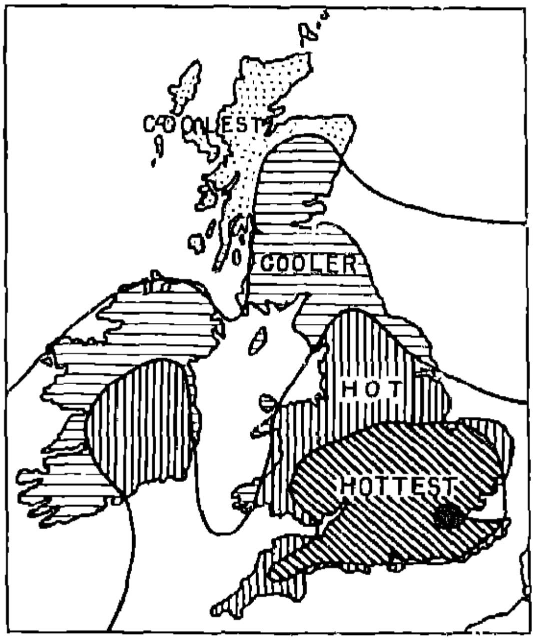


FIG. 69

Hottest and Coolest Regions in July

A talk such as the following should suffice:—

"We see that in summer the hottest places in the British Isles are in the south, and the coldest places in the north. Well, that is just what we should expect, for places farther from the Equator are usually colder than those nearer the Equator.

"But we see that in winter this does not occur. Let us see why, because there is usually a good explanation for most things. First you must know that a warm current crosses the ocean from the Gulf of Mexico (show the map of the world) to our own lands, and always washes our shores. In summer the land is much hotter than the sea, and so it does not make much difference to the climate, but in winter it makes a lot of difference.

"But, I must tell you another thing that happens also, and this is very important. You have been keeping a record of the direction of the winds at 9 o'clock each morning for a long time, and you have noticed that most of those winds come from the south-west or the west.

"Now let us look at the map once more, remembering two things for winter time—

"1. That there is water round our coasts that is not so cold as it would be if there were no Gulf Stream to warm it.

"2. That the winds blowing toward the British Isles come mainly from the *south-west*, and so blow over these fairly warm waters before they reach the western shores.

"Will those winds be warm winds or cold winds? Warm winds, of course! They will certainly be warmer than any east winds that blow from the colder lands of Europe.

"But, as they pass across our lands from the west, will they get warmer or will they get cooler, in winter? Cooler, of course! And that is one reason why the western lands of the British Isles are warmer than the eastern lands in winter."

The children might also be told of the cold easterly winds that blow from the Continent in winter, and so cause the east coasts to be colder still.

Exercises. Find the names of three seaside places where it would be nicest in winter, as far as warmth is concerned, to spend a holiday.

Which part of the British Isles has the most extreme climate (i.e. hottest in summer and coldest in winter)?

Which part of the British Isles has the mildest climate throughout the year?

All the above can be obtained from the maps, which certainly form a good "shorthand" of geography in the matter of generational climate.

Rainfall

As well as the heat and cold in summer and winter, "climate" also refers to the amount of rain received during the year, and whether it comes at one season or is spread over the year.

For Juniors, their own experiences of the British rainfall could be drawn on, so that they understand that rain occurs at all seasons. (For example, we can never be sure that it will not rain when we go out for a walk.)

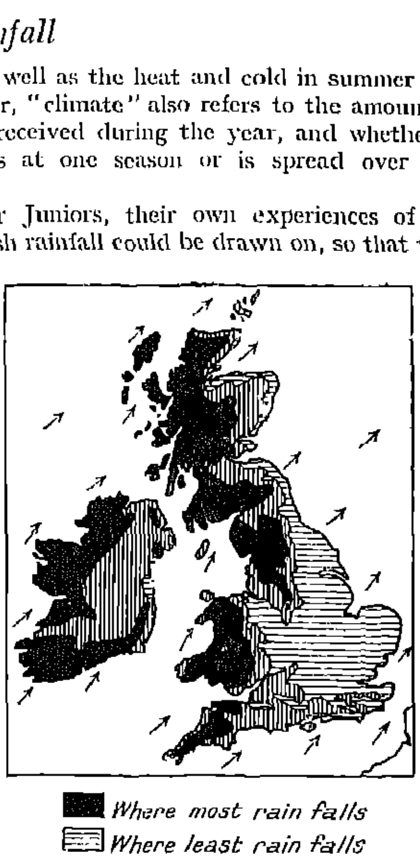


FIG. 70

British Isles: Rainfall

Hence, the annual rainfall map will be sufficient for the purposes of the Junior School

Such a map as given here should be used—showing places with most rain, and places with least rain. This gives three types of annual rainfall.

The following connections should be made from this map—

1. That the wettest regions are in the west.
2. That the driest regions are in the east.
3. That the rainfall appears to decrease from west to east.

Winds and Rainfall

The reasons for the annual distribution of the rainfall are concerned with—

1. The direction of the prevailing winds, which we have already been told come from the south-west.
2. The position of the highlands.

These two factors help to account for the heavier rainfall on the western coasts.

How Winds Bring Rain

This is a suitable opportunity to give an elementary account of the connection between winds and rain.

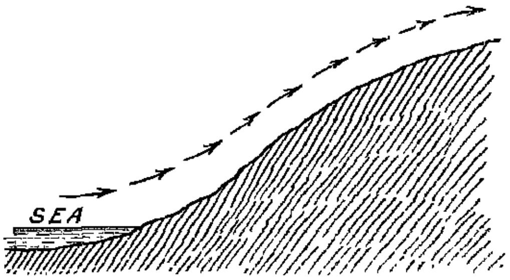


FIG. 71

Diagram to Show How Winds Bring Rain

Fig. 71 will help to do this. Try to get the children to appreciate the fact that air holds water vapour (moisture), and that when it is warmed it can hold more, but when it is cooled it cannot hold so much. Also that winds are simply moving air. The diagram will explain the rest.

The south-west winds from across the Atlantic Ocean collect much moisture. On reaching the shores of the British Isles, they are forced to rise by the highlands on the west. The rising air is cooled, and so it cannot hold so much moisture. It is forced to give up its moisture; in other words, rain falls.

By the time the winds have crossed the highlands, they are much drier than they were before. (This gives a broad generalization that accounts for the drier east coast.)

Summary of the Relief and Climate

It is important that the teacher revises from time to time, so that the knowledge gained so far by the class is consolidated, and made a whole, if possible.

For example, at this point in the course, a general revision of *the suitability of our own lands for people to live in* could be taken so that it includes what has been studied so far.

It has been seen that

1. The British Isles have many regions of lowlands, on which people could easily live, provided the soil is fertile, and the climate suitable.
2. Our lands are temperate lands—being neither too hot in summer, nor too cold in winter.
3. Enough rain falls in all parts of the British Isles for plant growth, i.e. no place is a desert through lack of rain.
4. The western lands are wetter than the eastern lands.
5. The prevailing winds come from the warm south-west—across the warm waters from the Gulf Stream in winter.
6. The western slopes of the highlands will receive more rain than the eastern slopes, and the western lowlands receive more rain than those on the east.

The Broad Climatic Regions of Our Own Lands—in Terms of Farming

As the climatic conditions control the type of work done by many of the workers in the "country" districts, a fairly definite idea as to the reasons for the different types of work carried on in the broad categories of farming will be found very useful to the child.

These reasons often concern the climate of any particular region. Hence, while the ideas on the climate of the British Isles are fresh in the child's mind, it will be a good plan to divide up our own lands into the broad regions of farming, according to their connections with the differences in climate to be found in the British Isles.

These regions should coincide with those to be taken in detail in later lessons.

The divisions should correspond to the following scheme—

1. *The Farmers on the Lowlands.*

(*a*) The *Wheat Farmers* of the eastern English lowlands. (In summer, the driest region, and hot.)

(*b*) The *Fruit Farmers* of Kent and the Evesham valley.

(*c*) The *Cattle Farmers* of the western lowlands of Britain. (Wetter than the eastern lowlands.)

(*d*) The *Cattle Farmers and Dairy Producers* of the Irish Plain. (Mild and wet.)

(*e*) *Mixed farming*—crops, animals, and dairy produce.

2. *The Farmers on the higher lands.*

The *Sheep-lands and Shepherds* of the hills.

The maps that follow show how these regions roughly divide up the British Isles into farming regions, each of which is most suitable for a certain kind of farming.

The life of the people living on each of these types will be taken in the classroom. If time is short, and the teacher feels that the manufacturing industries should receive early attention, then the minimum treatment should deal with—

The Wheat-lands and Wheat Farmers of the drier eastern lowlands.

The Cattle-lands and Cattle Farmers of the wetter western lowlands.

The Sheep-lands and Shepherds of the hills and higher lands.

THE WHEAT-LANDS OF THE ENGLISH PLAIN

The lowlands of the British Isles are the most suitable regions for growing things of all kinds. The soil is more fertile, and the climate is more suitable there than on the higher lands. For example, very few people live on the Welsh Highlands because (1) the land is so high that the climate is very bleak at most seasons of the year, (2) there is little good farming soil, (3) the western slopes of the highlands receive too much rain.

But certain lowlands are more suited to some things than to others. The western lowlands of England receive much more rain than the eastern lowlands. They receive so much rain that they are not suitable for wheat growing, in which many days of hot, dry weather are required, in order that the wheat may ripen.

The best wheat-growing lands in the British Isles are the lands shown on the map Fig. 72. The more important ones are those in East Anglia. It is seen that these wheat-lands are on the eastern half of the English Plain, and our "heat and cold" maps show that East Anglia is one of the warmest regions in the British Isles in summer.

The rainfall map shows us that the rainfall is not as heavy there as it is on the west. Also the soil is very fertile.

Now let us see in what kind of region wheat grows best

Wheat requires a soil that is not so light that it lets the rain soak through it as soon as it falls, as does sandy soil, or the chalk hills that run across England from south-west to the north-east. Neither does it do well on heavy soils, such as clay, that will not allow the rain to pass through. It requires a mixture of these two types of soil.

Such a soil is found in the eastern counties of England.

What climate is most suitable for wheat growing? Wheat requires plenty of hot sun and little rain during the ripening season. Our climate maps show that these conditions also are fulfilled in this region.

(The children should fill in the Wheat-lands on a blank map and colour them. A short note by the side of the map could give the above essentials for wheat-growing under the heads of *soil* and *climate*.)

As human geography is concerned with the human response to physical conditions, the important thing—especially in the Junior School—is to study the lives of the people who live in any one region. Hence we must next take—

The Life of a Farmer on the Wheat-lands of Cambridgeshire

The treatment of the human geography of

the agricultural regions in the classroom will naturally depend on the environment of the children. In a wheat-growing region many of the details very necessary to the child living in a large town will be unnecessary to the child whose home centres round wheat production. With such children the more scientific aspect of the farmer's life could be taken, and the child's knowledge of his own environment should be expanded.

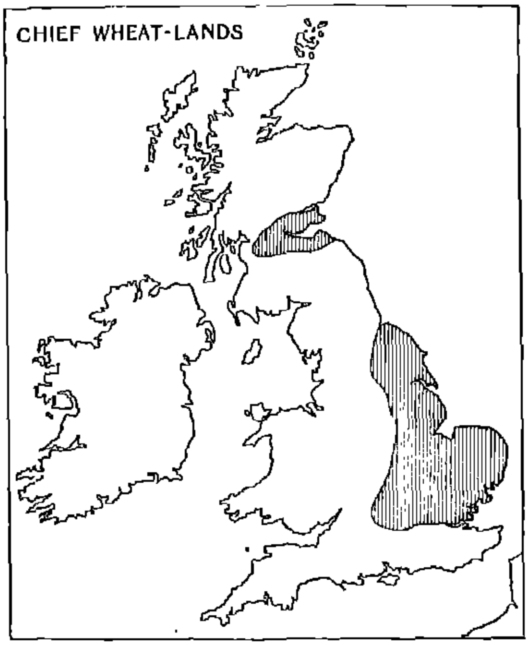


FIG. 72
Wheat-lands of the British Isles

The atlas shows the names of the counties in this region where many of the people living in the country are earning their livings by helping to grow wheat. Cambridgeshire, Hertfordshire, and Huntingdonshire are three of the English counties that grow most wheat The map shows that *Cambridge* is the most important town in Cambridgeshire, and *Huntingdon* is the largest town in Huntingdonshire. Both of these towns are market towns of the wheat-growing regions that surround them.

The Four Seasons of the Year

The teacher of the town child will appreciate the fact that most of his pupils are grossly ignorant of the very elements of the production of his daily needs—especially the production of the commoner articles of food, such as bread and meat. To the young town child—and to many grown-ups—"shops" are the origin of all things. Bread and meat are obtained from shops; even if the child can go further than this, too often he has no real ideas of the hard work necessary to provide his wants. The geography lesson can do much in enlarging the horizon of these young people, so that they begin to appreciate the wonderful inter-action whereby every one seems to be working for every one else, so that the many wants of all are supplied.

In the lessons on the lives of the people working on the land, a clear idea should be given of the differences in the lives and work of those employed in various "farm" industries at each season of the year—especially in terms of the various "seasons" of importance to each. For example, for the farmer of arable land the important seasons are—*ploughing*, etc. (preparing the land), *sowing* (and keeping the land clean), *harvesting*. For the sheep farmer the important seasons are—*lambing* and *shearing*.

Hence the teacher should base his lessons on what happens on the farm at these crucial times; at the same time he should emphasize the climatic conditions at each of these "seasons" (as has been done in previous lessons on regions in other lands).

Once the children appreciate these seasonal features, the teacher should try to get them to trace the future history of the product, from the raw material to the "ready-to-be-consumed" article.

The above sounds very advanced and intricate for the child of 10 or 11 years, but it has been found, in practice, that it is the minute details that are delighted in, and which are stored away in the mind of the youngster, who is usually so eager to obtain *definite* knowledge.

As an example of method the treatment of the life of the wheat farmer of the wheat-lands is given here fairly fully.

Winter: Preparing the Land for the Spring

The farmer's land is bare at this time of the year, for he has had a good crop from it last season, and he cannot grow anything in winter. But he must begin thinking of his next year's crop, and soon commences preparing the land, in order to make it healthy and rich with good food for his new crop. This means *ploughing* and *manuring* his ground, and letting the fresh winter's air get to the soil.

One still sees on some of the smaller British farms the ploughing done by a horse-drawn plough, so different from the motor ploughs that you know are used on the wheat-lands of Canada. These are more and more used to-day in our own lands, but the horse-drawn plough at work is a lovely sight. When the mornings are chilly, you can see the farmer ploughing his land for perhaps the second time since harvest. His sturdy horses are tugging at the plough, which is firmly guided in a straight line by the strong, muscular hands of the farmer. Up and down the field trudge he and his horses. The steam rises from the horses' bodies as they pull their hardest in order to turn up the dark brown, wet furrows. They seem to know how important their work is to the farmer.

Many furrows are ploughed before the farmer leaves off for his lunch. His wife has packed him a half a loaf, a piece of bacon, and a chunk of cheese; he is also very grateful for the large bottle of brown ale (or perhaps cocoa) that she put in his bag. Of course, before he began his lunch he saw that his horses were comfortable, and gave them their lunch also.

After his meal and a pipeful of tobacco, he starts once again—up and down the field—until the sun is very low in the sky. He stops his work, and leads the horses back to the stables, where he gives them a good rub down and a feed. They have certainly earned a good meal and a long rest, for they have done some very good work for him. He feels happy when he knows that his horses are comfortable, and he eagerly steps out toward home. (Point out the difference between this case and the one where the farmer uses a tractor.) His wife and children are waiting for him, and, after a good wash, he sits down to a "high tea." His wife talks about the cow which has given an extra large amount of milk on that day, while his eldest daughter says that the hens are still laying fairly well.

In his armchair, by the warm fire, he looks at the paper, and feels very drowsy. Suddenly, he sits up with a start, and realizes that he has been dozing. The cool nose of his dog has awakened him, and he slowly rises and turns on the "wireless." He spends a pleasant evening, hoping that there will not be a frost for some time because he wishes to finish his ploughing as soon as possible. Most evening he spends some time on accounts and records.

The next few weeks are spent in ploughing and manuring, and at last, after *harrowing* and *rolling*, he realizes that his fields are in good trim, and are now ready for the sowing.

Sowing

He has already bought his seed, and is only waiting for the right day to come.

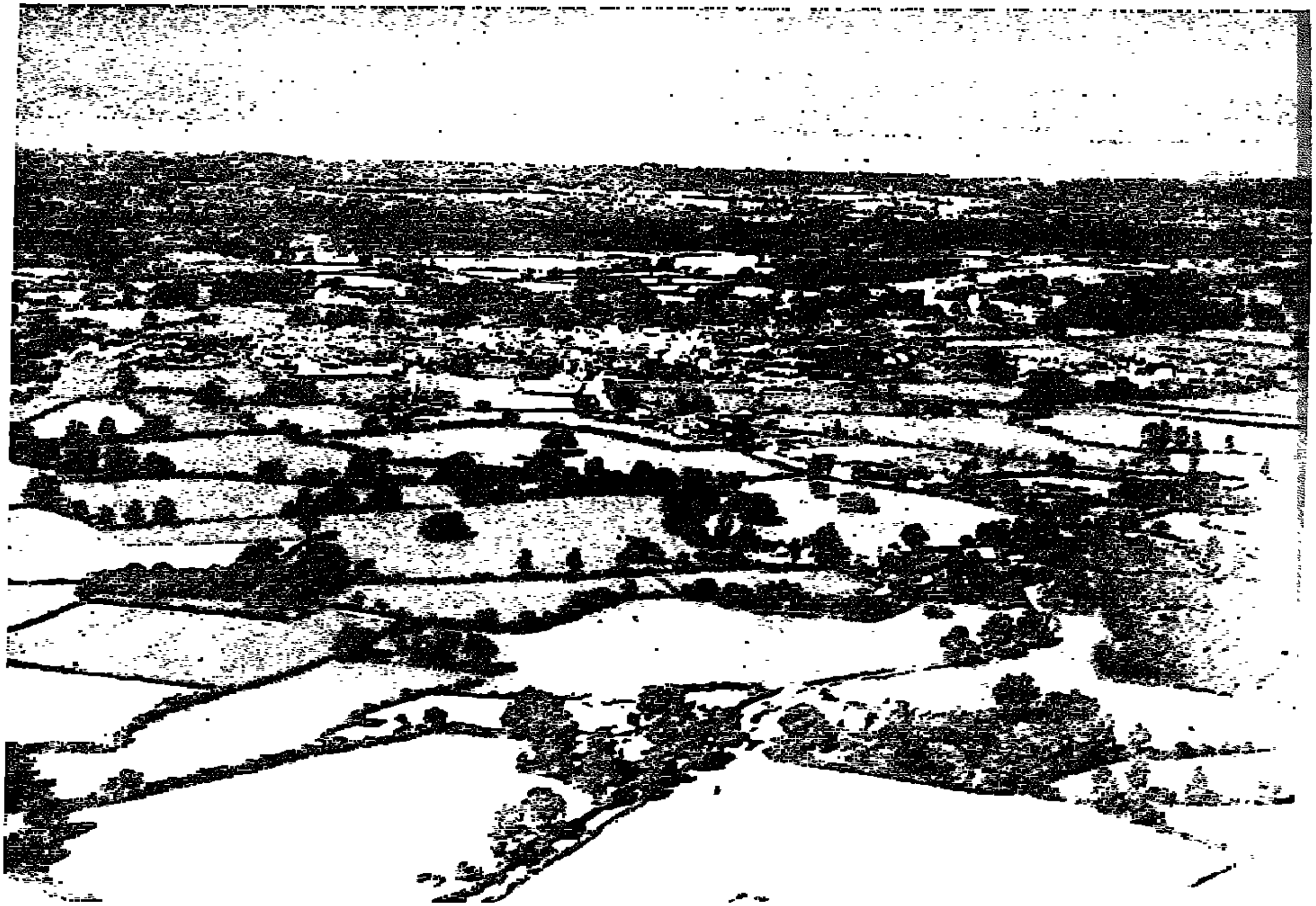
He makes sure that the sowing machine is in good order, and when all is ready he begins this important work. As he drives up and down the field, the machine drops the fat seeds into the furrows, so recently ploughed.

That night he feels very contented, for he has done all he can, and can only hope that the weather and the rain will be such that he obtains a bumper crop, next harvest.

The birds worry him a little during the next few weeks, for they seem to think that he has placed the seed in the fields for them to feed on. Poor birds! They are rather hungry, for the trees are bare and there are few insects to be found. But the farmer does his best to see that they do not eat all his corn.

Spring: The Growing Time

The rain has thoroughly soaked the land during winter time, and the seeds are softened. On the arrival of the first spring days the farmer is very pleased when the sun shines warmer and warmer. He knows that the softened seeds will soon respond to the gentle caresses of the sun. One morning, on looking out of his window, he sees that the expected has happened. The field



Photograph by Aerofilms Ltd.

FIG. 73

An Air View of Agricultural England

that he has so patiently ploughed, harrowed, rolled, and sown looks as if it has been chalked over with thin green lines in the night. These lines are the rows of tiny seedlings that have at last managed to raise their first piece of green leaf to the warming sunlight.

As the days get warmer and longer, the field of wheat shows more and more that the farmer is going to be well paid for all the labour he put into the field.

Summer: Full Growth

Spring is over. Summer is here. The wheat is now almost full-grown, but still green.

As the days get hotter and hotter it is seen that the wheat must be full-grown, for the stalk is gradually turning to yellow and gold.

(Describe a walk through a large field of wheat on a warm but breezy summer's day, noticing the occasional daisy and poppy, the birds, and the neighbouring trees in all their summer splendour.)

The farmer is very pleased at the good crop that has grown, and hopes that the weather will remain settled until it is reaped and harvested.

Autumn: Harvest Time

For farmers all over the world, no matter the crop, the harvesting of the produce of the fields is one of their busiest times. In Britain it is also one of the most anxious times, for if wet weather sets in before the crop is harvested it is ruined, and then all the year's labour has been in vain.

Hence harvest time is a time of hurry in Britain. Often extra labour is obtained, and all the farm labourers expect to work for very long hours, from sunrise to sunset. They receive a harvest bonus for this extra harvest work.

Those of you who have seen the harvesters at work know that the crop is harvested by machinery in Britain to-day. Formerly it was all done by hand—by means of the long scythe. Harvesting was certainly a long job then, and required many more men than to-day.

The *harvester* is a machine drawn by three horses or a tractor, guided by one man. It cuts the wheat close to the ground, ties it into bundles or "sheaves," and leaves them on the ground. The sheaves stand in shocks in the sun in order to get thoroughly dry.

When dry they are taken to the *steam thresher*, another very wonderful machine, which not only separates the seeds from the ears and straw, but even pours them into sacks, ready for market.

The Products of Wheat

As far as possible, in each industry studied in school, try to let the children realize how a use is found for the by-products, so that nothing is wasted. The wheat farmer obtains chaff, straw, flour.

The marketing of the wheat might be left until other types of farming have been considered, as below.

THE CATTLE-LANDS OF THE BRITISH ISLES

In the study of the wheat-lands of the British Isles, the children have seen the suitability of the drier and warmer eastern lowlands for such a crop as wheat. Turn now to the lowlands of the western regions, first of Britain and then of Ireland. These lowlands have a much heavier rainfall than the lowlands of the east and south-east; also much rain falls in the summer months.

Hence these lands are too wet for wheat-growing. The farmers of these regions have found cattle-rearing more profitable. The wetter climate causes long juicy grass to grow quite naturally, and on this grass many cattle feed. These cattle produce not only good British meat, that is sold for a good price in the towns, but the cows are kept for their dairy produce—of milk, cream, butter, and cheese. The map shows very clearly these cattle-lands of Britain and Ireland. Notice particularly the Central Plain of Ireland, the Cheshire Plain, and the plains of Somersetshire and Devonshire. Note Cheshire cheese, Devonshire cream, etc., according to the agricultural knowledge of the class.

The Life of the Cattle Farmer of the Wetter Lowlands of the West

Point out the main differences between the life of the wheat farmer and that of the cattle farmer. The "farm" of the latter has more outbuildings, and the work in connection with the animals is naturally a daily process, rather than a more seasonal one.

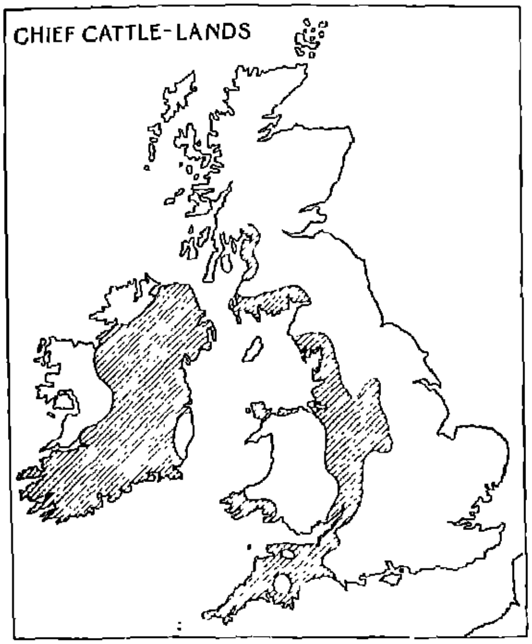


FIG. 74

Chief Cattle-lands of the Western Lowlands

Give a typical day in the life of the man who specializes in cattle, and show how every one on the farm is kept very busy in the routine work of, say, putting to grass, preparation of cattle foods for their return, regular milking, care of sheds, etc.

Dairy Produce

Describe the usual methods, and point out that in these days of heavy milk production for the large towns, machinery is often used. Note the work in the dairy on a small farm—mainly done by the women and girls.

The milk trains to London or to the large town nearest the school. The farmer's part. The railway's part. The town dairyman's part. Bottling, etc. The need for cleanliness in every operation.

Try to get the class to appreciate the skilful organization necessary to keep a large town provided with fresh milk daily.

Ireland: Cattle and Dairy Products

Give the class a description of a typical Irish farm. Introduce the phrase "Emerald Isle," and let the class realize its significance.

Ireland is a land of ever fresh grass, on which are reared some of the finest cattle and horses in the world. Ireland is a typical agricultural country. It has little coal, few manufactures outside Northern Ireland, and a small population.

Cattle, dairy produce, pigs (therefore bacon), and potatoes are Ireland's main products. Notice the importance of the potato and the pig in the life of the ordinary peasant, who has not a very high standard of living.

From Ireland to Britain

The above talk on Ireland from the cattle farmer's point of view, naturally leads to the question of the movement of the Irish produce across the sea to Britain.

The atlas can be made to tell a lot, if used carefully. Let the children find the ports and follow the routes across the sea to their obvious destinations.

This, in turn, leads to the movement of the produce of the English cattle-lands, and so to an introduction to some of the neighbouring industrial centres, where the people are unable to produce either meat or other kinds of food for themselves.

It is better to take only one or two examples, such as "Fresh Meat and Dairy Produce for the Black Country," and which region buys the produce of, say, the cattle farmer of Anglesea.

A Typical Market Town

The study of agricultural Britain and Ireland eventually leads to the market town, its importance to sellers and buyers, and the reasons for the actual position of any such market.

Before generalizing, it is better to take a typical example, for preference one with which the child is familiar.

In most agricultural regions market day is a very important day in the lives of the farm workers and the farm owner. It is usually once a week at each town, and always on the same day.

The market-place is crowded with all kinds of stalls on which the seller displays his goods. But the most important part is the cattle market. This is provided with pens for the animals, and many other conveniences for the farmer who has brought farm produce to be sold.

Most people have come to the market either to buy or to sell. If a farmer wishes to buy a good bull, he will usually find what he wants in one of the neighbouring cattle markets. The animals he wishes to sell are sent to the market and bought by the people who want them—perhaps by the butcher, who has a very good eye for animals that will make good meat. Sometimes the farm produce is sold by auction.

Let the class turn to a map of the district of the market town, while the teacher continues somewhat as follows—

"Notice the number of roads that all lead to and from the market town. On market day these roads are much busier than on ordinary days. Horses, carts and vans of all kinds, cattle being driven, a motor-lorry loaded with produce of all kinds, a motor-car driven by a farmer's daughter—with a crate of live chickens in the back seat—all are hurrying to market.

"Some hours later, the traffic will be going in the reverse direction—all returning home, either with the money obtained for goods, or with other goods that have been bought with the money.

"Now one can see why so many roads lead to and from the market town. They act as the feeders of the market.

"The same map shows the railways of the district. Notice that an important station is in the town, and that, if it is a very large market town, two or three lines from different directions may meet there, just as the roads did.

"To-day the railways are very important to the farmers of all kinds of produce. The large towns require so much fresh food that they often send their produce by rail to the shopkeepers of the large towns."

Cambridge and *Huntingdon* are good examples of important market towns of the Wheat-lands. *Hereford* could be taken as a good example in the cattle-lands of western England.

Mixed Farming

This is more often the rule in the lowlands of Britain. Apart from cereal crops, the man who keeps cattle cannot feed them on grass only—especially in winter.

Fodder crops must be grown—such as clover, lucerne, beans, and the many root crops such as turnips and swedes. The cattle have special meals of these foods, apart from what they may be able to get from the fields.

The farmer who keeps bullocks wants them to grow full-size and become fat, for the butcher, as soon as possible. He gives his cattle very good food, which costs him a lot of money. Cattle "cake" is a recognized part of the animal's diet. This "cake" may be cotton-seed cake, linseed cake, or a cake made from similar seeds that have been crushed to obtain the precious oil. For example, there is cattle cake made from monkey-nuts, and from palm kernels—after the oil has been removed by machinery. These cakes are very nutritious and fattening.

Life on a Mixed Farm

If the farm is a large one the farmer has many things to think of and attend to. He must have a good knowledge of crops, as well as of cattle. If he makes mistakes, then he suffers, because he does not receive so much money for his products.

Life on such a farm is very interesting to the visitor, and to the farmer's children. They can always find something to play with, although they have to help father and mother in many things.

Why does any farmer produce so many things—far more than he and his family could possibly consume? He produces them so that he can sell what he cannot consume himself. With the money he buys the things that he is unable to produce himself. Many of these things he obtains from the shops in the nearest market town.

Note. Other products from cattle, e.g. hides, leather, which leads to a remark on tanneries and the boot industry.

Place Knowledge

In connection with the need for increasing familiarity with the atlas and the acquisition of the usual place knowledge, the teacher, in taking the geography of the wheat-lands and the cattle-lands, should let the children colour or shade each of the regions on a blank map, draw the main rivers carefully, and mark the chief towns. But, even then, "drill" should be given in pointing to regions and places with little hesitation, e.g. Somersetshire, Devonshire, the Severn, Cambridge, Norwich, the Shannon, Dublin, Anglesea, Hereford, the Black Country—and any other place knowledge that the teacher thinks necessary at that particular stage of the course.

THE SHEPHERDS OF BRITAIN: THE SHEPHERDS OF THE HILLS

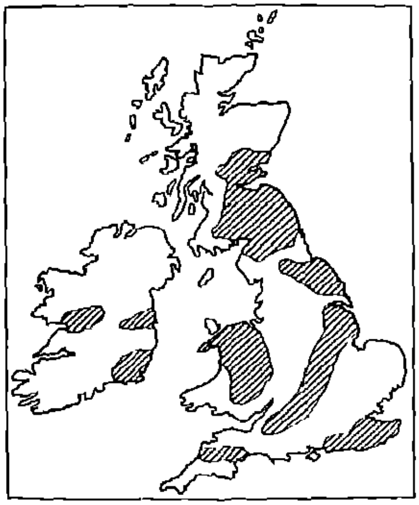


FIG. 75

The Chief Sheep-lands

(Note the connection with the Highlands)

With the physical map in front of them, the class could be asked, "What regions have we said little or nothing about so far? We have studied the drier lowlands of the east, where the wheat farmers live, and the wetter lowlands of the west, where the rich long grass provides good food for cattle. On other lowlands or on both the above types of regions there may be mixed farming. Well, what regions have we left out, so far as working on the land is concerned?"

Such leading questions are often of great help in the classroom. They revise the previous knowledge, and naturally lead up to new knowledge.

Most children will at last give an answer referring to highlands, "mountains," or "hills."

These highlands could be pointed out again, thus helping general place knowledge, and a final stop could be made at the nearest line of sheep-rearing hills with which the class might be familiar—even if only from hearsay. For example, for London children a good start could be made with the *North Downs*—the chalky characteristics of which they have noticed on their motor-coach rides, or on their "Sunday School Treats."

The south-east chalk lands, or "Downs," are much drier than the lower clay lands near them. This is not because these hills receive less rain than the lower lands but is due to the greater porosity, and to the quicker drain off from the slopes. Hence, not such long grass grows there as on the wetter lowlands of the west. Neither is the soil as fertile as the mixtures of clay and loam in the lowlands. But a short, crisp grass grows, on which sheep flourish. The chalk down-lands of south-east England are more suitable for sheep rearing than for either cattle farming or the growing of crops.

Sheep become unwell and diseased if they are forced to live on wet soil; and they can live on grasses that would be too short for cattle.

Sheep Products

The children will quickly give the ordinary products obtained from sheep, viz. mutton and wool. It should be pointed out that some regions (Lincolnshire, Cotswold, Devon) are most suited to wool-growing, while others (Wales, Exmoor, Dartmoor) produce better mutton.

Sheep-lands of the British Isles

It has already been seen that the higher lands of the British Isles are usually unsuitable for the growing of crops or cattle rearing. But, except on the bleakest lands, grass will grow, and on this grass feed thousands of sheep. Each of the chief groups of highlands in Britain feeds many sheep and is the home of the sheep farmer.

The Pennines—especially the eastern slopes. (Note the origins of the famous wool industry.)

The Welsh hills—especially the eastern slopes (drier). (Note Welsh mutton.)

The Southern Uplands of Scotland and the Cheviots. (Note tweeds, and the wool industry.)

The Cumberland Hills of the Lake District.

The Life of a Shepherd of the Hills

In the heart of the hills the sheep may be allowed to roam a long way from their master's home, for there are sometimes open spaces which have little other value.

The shepherd's life is often a very lonely one. Few people live in the sheep-lands, which are usually very bleak in winter. On most of these lands, timber is scarce, and so the shepherd's house is made of stone, and even the walls enclosing the fields, or bordering the roads, are of roughly shaped stones. In the Pennines, the Welsh Hills, the Lake District, and Scotland this is very noticeable.

The busiest times for the shepherd are the lambing season and the shearing season.

The Lambing Season

This is a very worrying time for the farmer. The young lambs are often born when the snow is on the ground, and the farmer stays up for many nights, looking after the tiny, helpless lambs and their mothers. He is very glad when all the lambs are born. He can then have the first good and peaceful sleep he has had for many a long day and night.

As the days get warmer, the young lambs grow very fast, and hop, skip, and jump in the warming sun. They seem very pleased to be alive. The farmer wants them to grow up as quickly as possible.

Shearing Time

The sheep grows a thick coat of wool. To the sheep farmer this is very valuable, so he cuts it off regularly and sells it. The sheep do not seem to like this operation, for they struggle and kick, but the shepherd knows his business well, and has learnt the proper way to hold the sheep, so that it cannot escape, and will not get hurt. After a shearing the poor sheep wander about the field looking very miserable and bleating more pitifully than ever. But the days are getting warmer, and new coats will soon grow.

If it were not for the sheep losing his coat, none of us would be able to wear the thick, warm clothes that we require in our cool winter weather.

[The teacher could then trace out rapidly—or better still, obtain from the class—the various processes through which the raw wool must go before, say, a woollen vest or a thick jumper is obtained by Tommy Smith or Pamela Brown. (See page 452 for details.) This helps as an introduction to the wool industry, to be studied later.]

The Early Wool Industry of the Sheep-lands

Mention could be made of the importance of the export of raw wool in the fifteenth and sixteenth centuries. The domestic system of the wool industry could also be introduced, and pictures of the early methods of spinning and weaving. This kind of work was the "spare-time job" of the farmer and his family, and helped to make the farmer more self-sufficing than he is to-day.

Towns of the Sheep-lands

Those that still specialize in the wool industry should be noticed, such as *Trowbridge* in Wiltshire, *Frome* in the west of England, *Leeds* in Yorkshire, *Hawick* in the Southern Uplands of

Scotland. It might be mentioned, in passing, that the towns in Britain that produce most woollen goods receive the majority of their wool supplies from overseas—particularly from Australia; and that this industry is mainly carried on in one of the lands with coal, namely, *Yorkshire*.

Pictures

Throughout this talk on the sheep-lands and the lives of the sheep farmers, the teacher should show the children pictures illustrating as many points as possible. Such a list should include—

A typical view of hilly grasslands with few trees, and hardly any plough-land to be seen; sheep grazing.

A sheep-farmer's cottage—stone walls, stone "hedges."

Young lambs in spring—skipping and jumping.

Shearing time.

Woman using the spinning-wheel outside her cottage door.

The outside of a modern wool-spinning factory of Yorkshire.

TRAVELS IN OUR OWN LANDS

At this stage of the course—after the brief study of the agricultural regions of the British Isles, and before the study of industrial regions—a good plan is to take the children on imaginary visits to well-known regions of the British Isles. This helps revision, and familiarizes the children with the positions of regions and places with which they are brought into closer contact later.

A suggested method of conducting these travels is as follows.

1. *A visit to Wales*

The children would individually follow the route on their atlases; and, if Londoners, would notice the railway route (the following of *the easiest way*), the crossing of the various ranges of hills, and the alternating valleys, the main towns and the type of town (e.g. London, the great terminus and the largest town in the world—on the Thames; Birmingham—the capital of the Midlands—coal and hardware; Shrewsbury—an agricultural market town). At the same time the teacher would point out the various types of regions, e.g. *plough-land, sheep-lands* of the hills, *fruit-lands, lands with coal, manufacturing regions,* etc. But the whole lesson should centre round the work of the peoples (it is practically useless merely to mention, say, the phrase "manufacturing regions"; it must be interpreted in terms of men and women doing a particular form of work to earn their livings—because of the nature of the region). This is the keynote of human geography.

In this way the class will at last reach Wales—the distance and time taken by rail or car should be mentioned—and any experiences of children who have actually been there should be freely drawn on. Again, the importance of pictures must be emphasized. Before the lesson the teacher should attempt to obtain pictures showing the type of country: hills, mountains, rivers, valleys, arable land, pasture land, sheep land, coalfields, industrial towns, market towns and their market-places. A view of the main street of two or three of the large towns is also often an "education" to a London child, who often imagines that other towns cannot possibly have the realities of trams, buses, large shops, parks, cinemas, and bridges that he has experienced in London.

If such lessons are carefully prepared as above, the interest in them will more than repay the time spent in collecting the pictures; at the same time the teacher will be giving a "real" basis to all the child's future geographical studies.

How to Obtain Pictures of the British Isles

The ubiquitous *picture post card* has a most valuable use here, provided the card is chosen for its geographical merit. The *railways* practically give away wonderful pictorial material for such lessons.

Many small travel handbooks are obtainable from various sources, and it is only the question of the number of stamps that the teacher is willing to use that will limit the number of handbooks to be obtained from the publicity bureaux of many towns, especially those that cater for the visitor.

Of course, the children are a good source to draw on, so long as the teacher is fairly ruthless in the weeding out of pictures that do not teach geography.

The Film Strip. Possibly this is one of the places where the Strip is most useful. Slides also are sometimes of value. At the same time these should not supplant the study of other pictures, which are valuable because they can be studied at leisure.

2. *To Devon and Cornwall*

This will be a visit to the south-west of England. This journey would take the class through agricultural regions of various kinds—to the cattle-lands of the mild Devon valleys, to the moors and sheep-lands (Dartmoor) and to the mild south-westerly peninsula of England, with its rugged coasts and highlands, its ports, and its fishing industry.

3. *Land's End to John o' Groats*

This journey could be made by train or by road. In either case the children should follow the exact route used. The types of regions should be located carefully as they are reached, and the important towns noted. Good pictures are indispensable, especially if the teacher has not made the journey himself. (Even then, a journey by road is usually more "instructive" than the usual train journey.)

Once Scotland is reached more emphasis should be put on the features of the broad natural regions as they are passed through. To non-Scottish children, Scotland—like Wales and Ireland—is almost as much a foreign country as France, or Germany, or as London is to a school child of the Scottish Highlands.

The two main routes from England to Scotland should be noticed, and only one of these routes should be taken at this point; the other route being dealt with when the geography of Scotland is taken in greater detail.

This gives a good opportunity to appreciate how land routes of all kinds take the easiest and cheapest route. The railways are a good example of this. They follow the lowlands as far as possible, and, where highlands have to be crossed, they are crossed at their lowest points. The tunnels in some stretches might be noticed, and some idea gained of the enormous cost.

Rivers and Towns. After the journey has been made once, it could be impressed upon the children's minds in another way, by following the same route and asking them to make a note of—

1. All the rivers crossed.
2. All the highlands crossed.
3. All the important towns passed through.

4. *A Visit to the Lake District*

The children should notice mountain and lake, shepherds and scenery. *Tourists.* The catering for tourists shows that some people in the British Isles earn their livings neither from the land, nor as fishermen or traders on the sea, nor as the makers of things. A peep into how the peoples of a seaside resort or at a tourist centre like the Lake District earn their livings thus adds to the child's geographical experience.

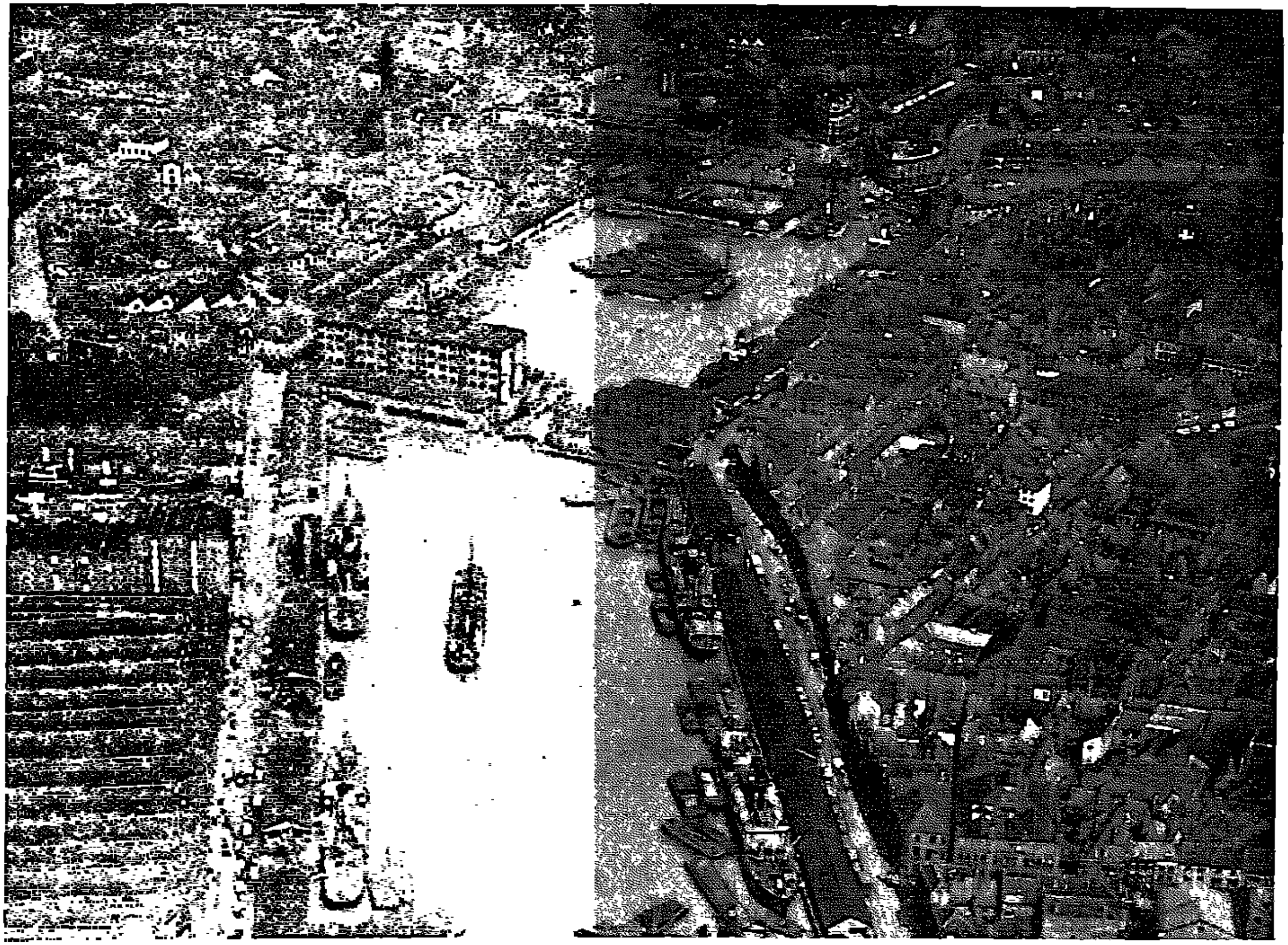
5. *From the Lake District to the Yorkshire Coast*

Starting from Kendal or a similar spot in the Lake District, the child follows the route to Scarborough—road or rail—across the Pennines, and realizes that these so-called mountains are not so great a barrier as he thought them. However, the bleakness and bareness of the region should be emphasized, and contrasted with the fertility and greater population of the valleys of the more sheltered lower slopes.

(Which side is the drier? Which side will be more suited to sheep? Are the Pennines good for growing things, for cattle rearing, or for sheep rearing? Why?)

6. *Off to Ireland*

Some such journey as this should complete our preliminary travels in the British Isles.



Photograph by Aerofilms, Ltd.

FIG. 76

An Air View of Hull, showing the Docks

Again the map must be followed carefully, and the route to the Welsh port taken. It might be more advantageous to take a route different from that taken on the first visit to Wales.

Once at the port—either Holyhead or Fishguard—describe the docks and the getting of the luggage and passengers on board, the final hoot of the steamer, and the gradual leaving of the harbour and land. Take an imaginary tour of the ship, describe how it works, and the arrangements for the comfort of the passengers. All this might be called human geography.

At last the Irish port can be clearly seen, and soon we land.

Take an imaginary trip across Ireland, using similar methods to those used above.

If these travels have been taken carefully, new interest will have been aroused in the future lessons, and a most valuable background to the human geography to follow will have been given. The children will have begun to see their own lands as a whole, and will already be able to fit certain details of human geography into that whole.

Much of the remaining part of the course will deal with the regions where the majority of the people of Britain live and work—namely, the industrial regions.

These are so bound up with the coal industry and the coalfields that the best way to introduce them, and give them the correct background, is to begin with a lesson, or two lessons, on the *Lands with coal, and the life of the coal miner.*

COAL

The children have already received, in previous years, general ideas of the work of the coal miner, and the value of coal to an industrial country. At this stage the past knowledge should be gathered together, made a unity, and expanded —all in terms of the coalfields of Britain.

As a preliminary, the teacher should make sure that the general ideas are made more particular, by pictures and description of the actual life and work of the people who earn their livings by getting the coal from the earth.

One of the most important ideas that the children should receive here is the enormous importance of coal in the lives of the people of Great Britain. Coal has made our people wealthy and great during the last 200 years, and it is because of coal that such a large population can live in such a small country. Coal enables the steam-engine to do the work of thousands of people.

The Industrial Revolution

To give the children an idea of the work done by coal to-day, they must be introduced to the methods of manufacture existing before the invention of the steam-engine. The wool industry could be taken as a typical example. *The domestic system of manufacture* could be illustrated by showing how a farmer could be almost self-sufficing, by growing his own food, producing his own wool, and (with his wife) making their own cloth—the wife doing the spinning and the man usually doing the weaving on a wooden frame in an outbuilding.

The invention of spinning machines and, later, weaving machines (at first of wood), and the use of the steam-engine to supply the power, enabled one man to turn out with these machines a hundred times as much cloth as he could make by the old methods.

Coal was the material used to create the power, and, with the increased use of the new machines, more and more coal was required.

To-day the largest industries are situated on the coalfields. This arose because of the cost of carriage of coal, both before and after the coming of the railways, but particularly before railways existed. Hence it was cheaper and easier to build the factories on the actual coalfields. To-day, the larger part of the British population live on the coalfields, and earn their living by making things of all kinds.

I. The British Coalfields

Show a map of the coalfields of the British Isles. By the side of this show a map of the distribution of the population. It will be noticed that, with the exception of the London region, the most heavily populated regions correspond to the coalfields.

To help the child to remember the names and positions of these coalfields it is perhaps better to divide them into groups. Such a division as follows has been found useful.

1. *The Coalfields round the Pennines*—particularly the Northumberland, the Yorkshire, the Midlands, the Lancashire, and the Cumberland coalfields.

2. *The Coalfields round the Welsh Mountains*—particularly the South Wales and North Wales coalfields.

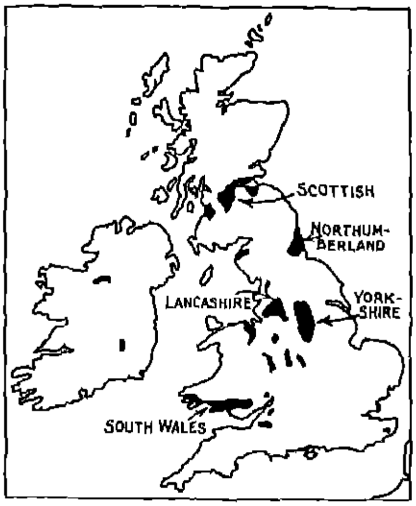


FIG. 77

The Lands with Coal. Note the scarcity in Ireland

3. *The Coalfields of the Scottish Rift Valley*—from the Firth of Clyde to the Firth of Forth.

Notice the absence of coal in Ireland. Consequently Ireland is an agricultural country, and cannot be a great manufacturing country, so long as coal has to do the work.

How Coal is obtained from the Earth

First give an account, suitable to the age of the children, of the formation of coal, many thousands of feet below the surface of the earth. (A different climate then; thick forests of the hot-wet type, although different from the hot-wet forests of to-day; the flooding of the forests through sinking of the land; deposits gradually laid on top of these forests for thousands of years, until the forests are turned to a black substance that we call coal.)

A large diagram should be drawn to show a typical section across a coalfield: seams, shafts, galleries, etc.

The Shaft and Pit-head. Show pictures of these, and point out the use of the various features, such as the large wheels for letting down and drawing up the cages of workers and coal, and the huge waste dumps.

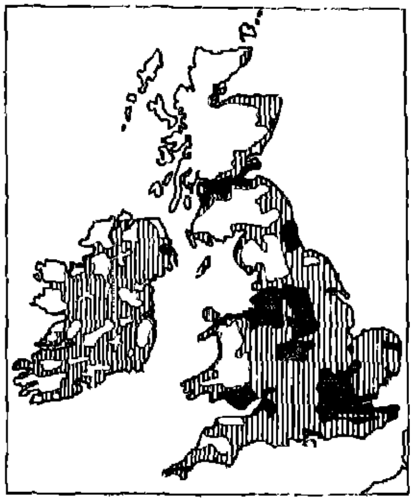


FIG. 78

■ *Where most people live*

□ *Where least people live*

Down the Coal Mine. Describe the usual conditions, mentioning such details as pit-props, picks and shovels, lighting and the safety lamp, modern machinery, the trucks and the method used for getting the coal to the surface.

Point out to the children the hard work necessary to obtain the coal, and the dangers to which the miner is liable.

What Happens to the Coal After it Reaches the Pit-head

Talk of the grading of the coal, the loading on to the train, and some of the possible journeys it may make: e.g. much is exported to countries that have very little coal; huge quantities go to the large towns to be consumed in the homes, factories, and such large industries as electrical and gas-works.

The Shipbuilding Industry of the coast coalfields—particularly the Northumberland, Cumberland, and Clyde coalfields.

For the Junior School the above industries, if taken thoroughly, should be sufficient to show the importance of coal to industrial Britain. At the same time, the more important regions are being studied.

As all the industries are dependent on iron and steel for their machinery, a good start could be made with the iron and steel industry of England, with particular reference to the Black Country. Here the methods of earning a living are again determined by natural resources of the region, but the latter is also appreciably affected by the former.

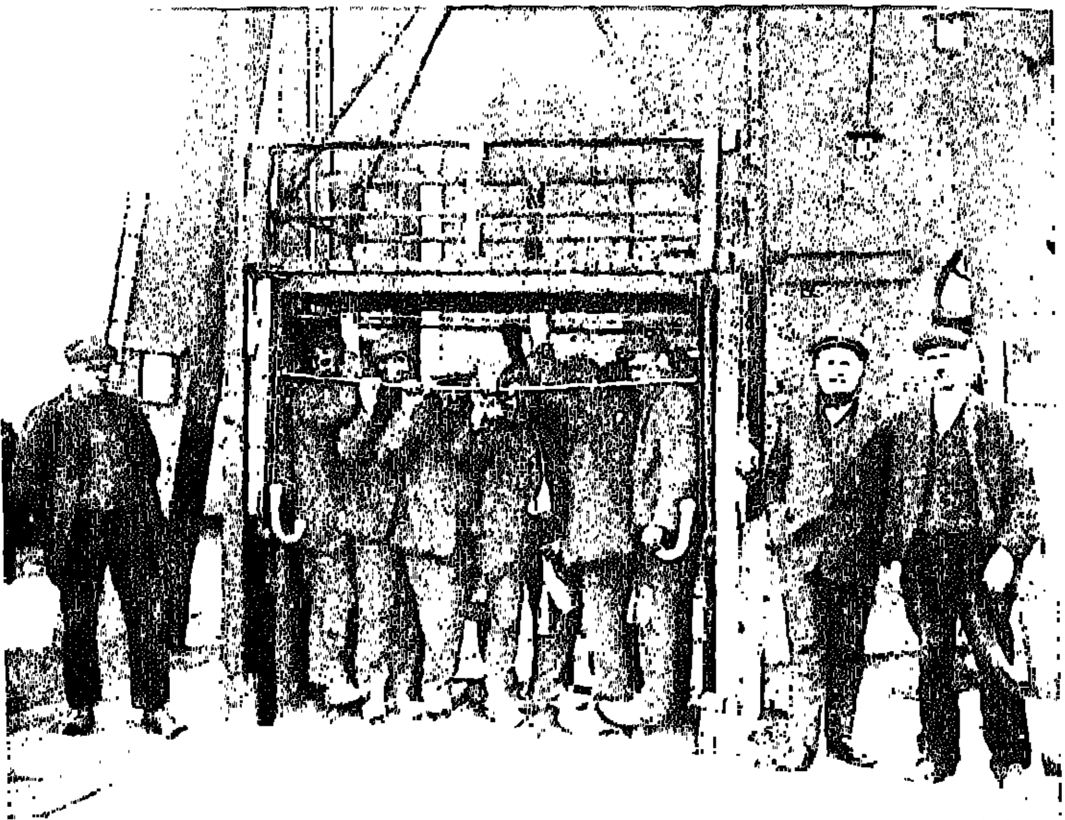


FIG. 79

W. F. Taylor

At the Pit-head: Going Down the Coal Mine

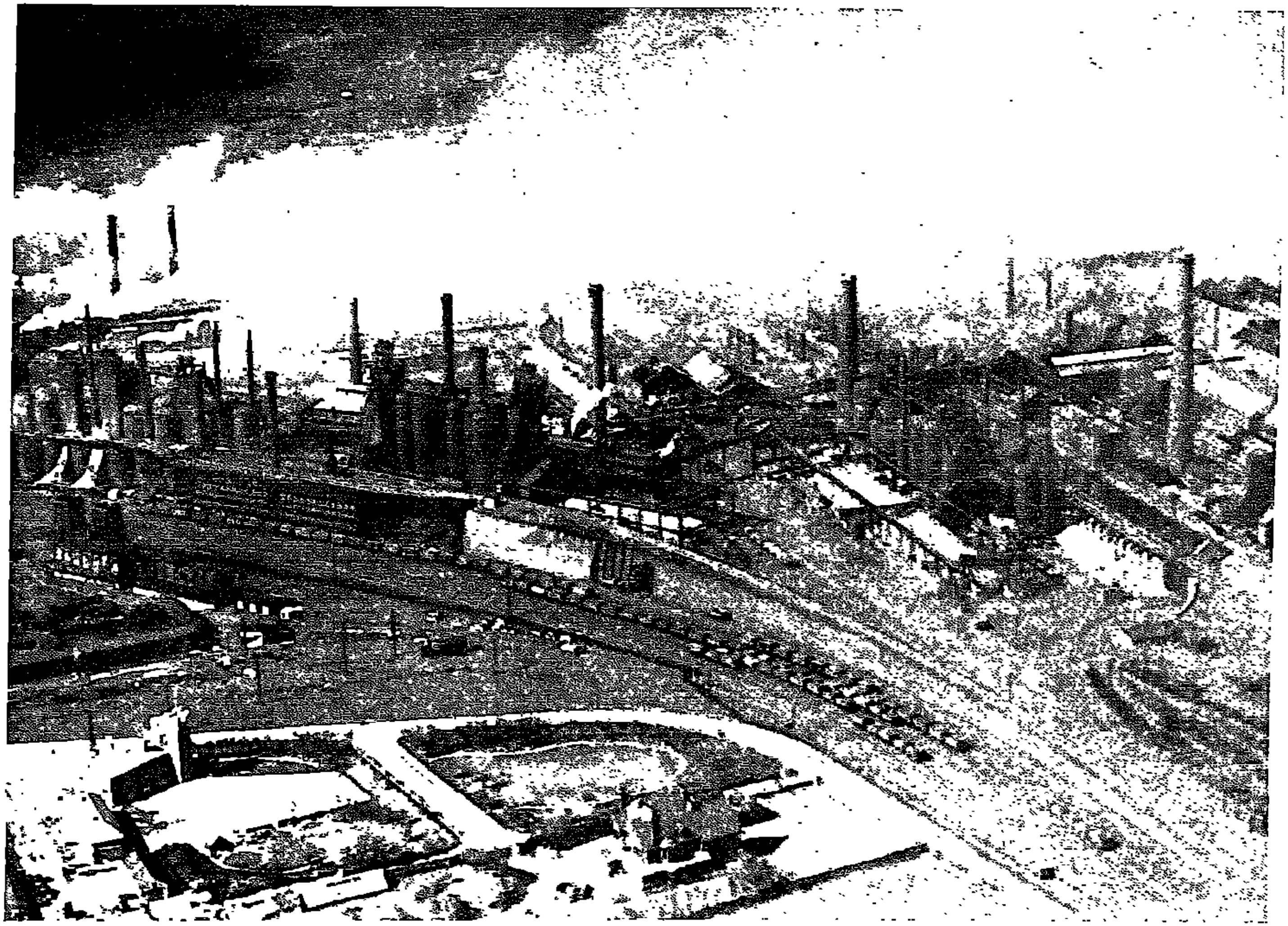
The Coalfields and the Important Industries of Our Own Lands

Coal is so important that the major industries of Britain have been built on the coalfields. Each of the large coalfields is associated with a great industry—

The Wool Industry on the Yorkshire coalfield.

The Cotton Industry on the Lancashire coalfield.

The Iron and Steel Industry of the Black Country—the South Staffordshire coalfield.



Photograph by *Aerofilms, Ltd.*

FIG. 80

Iron and Steel : Middlesbrough

II. *The Iron and Steel Industry of the Black Country*

This could be introduced naturally by making an imaginary journey to Birmingham by road from the school. The various regions of Britain could be mentioned as they are passed through, and important towns noticed. This acts as good natural revision. At last Birmingham is reached. The surroundings could be described to show the difference between the Black Country, where coal and iron are supreme, and the clean, peaceful agricultural districts on its borders.

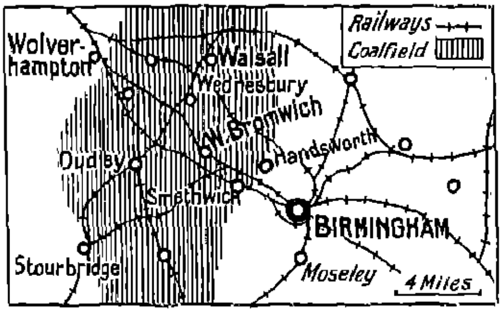


FIG. 81

The Black Country, showing towns, coalfield and rail connections

Note the tall chimneys, the mines, the dumps, the ruin that man has seemingly made in the countryside, while digging in the bowels of the earth for what he wants. A description of the Black Country by night is the usual method of getting children to realize the peculiarity of the region; but this peculiarity no longer is typical, as the tops of the blast furnaces are kept closed. A description of its appearance and the work of its people on an ordinary day is far more important, in order to give the correct reality.

The Importance of Iron and Steel To-day. Trace briefly the history of the use of wood, stone and metals, to show that we are really in the Iron and Steel Age to-day—or the *Coal, Iron, and Steel Age.*

Steel is iron specially treated to make it stronger and less brittle (see "Science," Vol. III).

Iron and steel are used for thousands of things to-day. The teacher should try to get the class to realize this enormous use by obtaining from them lists of things made of iron and steel. Let them notice particularly their use in the form of the many *girders* that act as the framework of so many modern buildings; the miles and miles of *rails* for trains; the still more miles of iron *gas-piping*; the enormous amount of *machinery* that consists mainly of iron and steel. Even mother's "tin" kettle is made of thin steel—coated with tin.

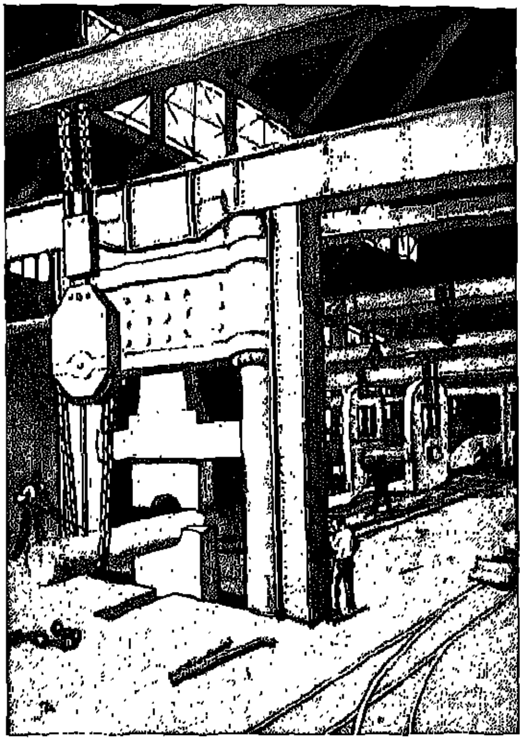


FIG. 82

In a Steel-works—Heavy Forging by Steam Hammer

How Iron and Steel are Obtained from the Iron Ore

Children usually love this part of the lesson, especially the boys. But, while the teacher must take care that the processes are simplified by him so that the Junior School child can understand them, he should also take care to introduce them as certain types of work done by *the people* of the Black Country (their method of earning their livings). Let the children realize some of the feelings of the various workers, at certain times of the day, such as when the furnace door opens, and a fierce draught of heat seems as if it wants to shrivel up the puny worker who dares to control it. In this way the geography can be really human, in so far as it helps the child to put himself in the place of other people and feel with them.

Points to be noted in the production of iron and steel are—

Iron Ore. Its description—no obvious traces of the metal. How it is obtained. How it was found together with coal, and hence the reason for the industry in certain regions. The import of iron ore from abroad, because of the enormous demand for iron and steel goods.

The Smelting in the Furnaces. Describe a furnace and how the loads of coal and iron ore, mixed with limestone, are dumped into the furnace from above, how the molten iron is allowed to run out, and how it is led into sand pits to cool into pig-iron.

The importance of the discovery of how to make coke should be referred to, as providing a material that smelts iron better than coal.

The making of moulded articles from pig-iron.

The additional operations required to turn iron into wrought iron and steel—stirring in the furnace, hammering it by steam hammer, and rolling it between heavy rollers.

The Black Country consists of a heavily populated district on the South Staffordshire coalfield, where most of the people have work of some kind to do with the production of iron and steel, and the making of goods from these metals.

Birmingham should be pointed out by the class, who should then notice the neighbouring towns that are almost strung together with Birmingham—especially from the S.E. to the N.W.

Wolverhampton, Walsall, West Bromwich, and Wednesbury are the largest and most important of these towns.

Birmingham is the capital town of this remarkable region. The map shows that all routes lead to and from Birmingham—roads, rails, and canals. It is situated in the heart of England. Because of its distance from the sea, most of the products of the Black Country are not large things like steam-engines, for the cost of transport to the sea would be heavy.

Give a description of the actual town, with its roads crowded with traffic, its trams, buses, theatres, and wonderful shops: Birmingham is the largest market centre of the Midlands.

In its factories all kinds of metal goods are made—iron bedsteads, fire-irons, iron desks, tools of all kinds, guns, cycles, and motor-cars are only a few of them. Point out how this differs from *the specialized manufacture* of certain towns—each town tending to make more of one thing than another, e.g. bicycles, needles, chains, scientific instruments, locks and keys, and so on.

THE WOOL INDUSTRY OF YORKSHIRE

Yorkshire is the seat of the wool industry of England. It produces more woollen cloth and woollen goods than any other part of the British Isles. *Bradford* and *Leeds* are two of the largest towns where the work of the people is mainly to do with wool.

The class should first notice the region on the physical map, its position on the eastern flanks of the Pennines, the rivers draining into the Humber and the North Sea, the largest towns, and any ports. Such information helps to give the necessary background of place knowledge, which will make the following lesson more concrete, more valuable, and more lasting in the children's memories.

The Wool Industry in the Past

If the lesson on the sheeplands has made a fair impression on the minds of the class, they will be able to recall one reason why there should be a wool industry in Yorkshire. Try to get the children to recall what they can of the shearing season, and how this wool was made into, say, a boy's coat, before the invention of the steam engine and the factory system. Pictures will revise many of these particulars.

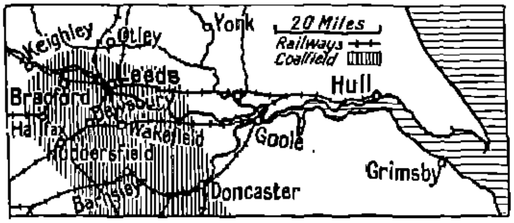


FIG. 83

The Location of the Wool Industry of Yorkshire

Revise the domestic system of manufacture.

Tell how English wool was so famous for its quality in Elizabeth's reign that it was the most important export from England at that time. (What is the most important export to-day?)

The Importance of the Yorkshire Coalfield to the Wool Industry

The importance of coal must be continually emphasized in the *main industries of the* British Isles. A reference to the map of the coalfields shows the large coalfield that lies in Yorkshire. Point out how the seams of coal dip down and get deeper and deeper toward the east, so that the shafts also have to be made deeper and deeper. This coalfield is the most valuable in the British Isles.

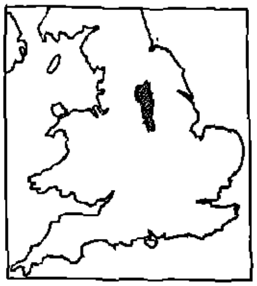


FIG. 84

Coal-mining in Yorkshire

The Wool Industry in Yorkshire To-day

With the invention of spinning and weaving machines, and the invention of the wonderful steam-engine that did the work of driving them, coal became a very important item to the owners of the factories. But there were no railways in those days, and so it was a very expensive business to have coal carried long distances, especially as it is such a bulky material.

Hence, the wool industry concentrated on the Yorkshire coalfield, where the wool could be obtained from the neighbouring sheeplands, as formerly.

Many factories were built on the coalfield, the machines and steam-engines to drive them were installed, and in place of quiet, peaceful, and clean rural areas there grew up a region of villages and large towns that were very different from the former "country" regions—tall chimneys, belching smoke, thousands of people packed into quickly-erected houses, and men, women, and children all working in the factories for many long hours and for very small wages. This time was a very bad one for the work-people, who were forced to change their habits with the change of occupation.

The Main Processes of the Wool Industry

With children of 10-11 years, unless they are *living in the region itself*, only the main processes should be taken in class, in order that they may receive some idea of the work of the people in this region. In any case, the two main processes of spinning and weaving should be taken. These processes should be made concrete by practical illustration. Spinning can be understood by twisting the raw material by hand, while weaving can be illustrated by pulling a piece of broadly woven material to pieces, so that the child can see how the two sets of threads cross each other into a weave. (See details in the previous course—under "Food, Clothing, and Shelter.")

Spinning. Pictures of modern spinning machines should be shown so that the children can see the thousands of threads that are spun at once. This should be compared with the old hand method, and the wonders of modern machinery that can do such things should be enlarged upon.

Weaving. In a similar way pictures of a modern weaving machine should be shown, and some idea of its working given.

The more detail that the teacher can give the children in such industries the better, so long as the process can easily be understood by the child.

Rolls of Cloth. Eventually the teacher will have described the work of the various machines, until the roll of brand new cloth is obtained.

How far he ventures after that depends upon his knowledge of and interest in the processes concerned. If he knows much, the children are bound to be fascinated, for they quickly recognize the expert.

The rolls of cloth might then be traced to the maker of woollen articles in, say, Bradford or Leeds, or on their journey to London, or to the far ends of the earth.

Articles Made from Woollen Cloth

In order to emphasize the importance of machinery in industry, as thus illustrated by the wool industry, further investigation should be made in class to show what happens to the roll of cloth before it is finally used as a suit of clothes for Harry, or a thick winter coat for Daphne.

In this way even the young Junior of 10 to 11 years will begin to obtain some appreciation of the wonders of the modern economic system, where one machine, looked after by one man or woman, is able to do as much work as hundreds of people in the pre-industrial period.

Remind the child of the more primitive peoples studied in previous years—the simple *hunters,* such as the Eskimo and Pigmy, the simple *herdsmen* of the Steppes and Palestine, the simple *farmer* of China or India, or the simple native *worker in iron* of the West coast of Africa. Then compare their practically self-sufficing life with the work of the factory "hand" in Yorkshire. How does he obtain all his wants? In some wonderful way he can go to the "pictures," or have a haircut, or buy his child a present, and also buy in the food-shops the food he desires. How is it done? If some such questions arise in the minds of the Juniors, the geography lessons will not be wasted, quite apart from their purely geographical value.

All the above things help the child to realize the inter-dependence of the workers in the various industries of the British Isles, as well as their dependence on the work of peoples of other lands. Possibly an appreciation of such matters is more likely to achieve the desires of the exponents of the United Nations Organization than a purely historic method.

Towns and Ports

The lesson or lessons on such a subject as one of the great industries of the British Isles would not be complete without some words on the large towns and ports of the region.

In the case of the wool industry, the children should notice particularly the positions of *Bradford* and *Leeds,* from the physical point of view (e.g. hills, coal), as well as their positions with regard to other towns. Notice the railways passing through these two large towns, and how these railways connect them not only to the neighbouring ones, but also to those far away; they are railway junctions. Notice the routes across the Pennines connecting the large towns of Yorkshire with those of the neighbouring county of Lancashire.

Hull

Get the class to notice how the waterways of Yorkshire lead out into the mouth of the Humber. Notice the position of Hull, the great port of the region. It is the obvious outlet of the Yorkshire region. But to-day much traffic passes across the Pennines, and so to the ports of Lancashire. (Why is this?)

Hull is likely to bring into Yorkshire many of the things from overseas required by the people. Remind the children that Yorkshire no longer produces more than a small fraction of the wool required by its enormous wool industry. Most of this wool now comes from the sheep farms of Australia, thousands of miles away.

London is the greatest market for raw wool

THE COTTON INDUSTRY OF LANCASHIRE

After the wool industry of Yorkshire has been studied, an interesting comparison and contrast can be made by taking the cotton industry of Lancashire on the other flank of the Pennines.

Let the children notice on their atlases the number of large towns on the western slopes of the Pennines. Incidentally they will also notice the blank area of hardly any population that separates the two busy regions of Yorkshire on the east and Lancashire on the west.

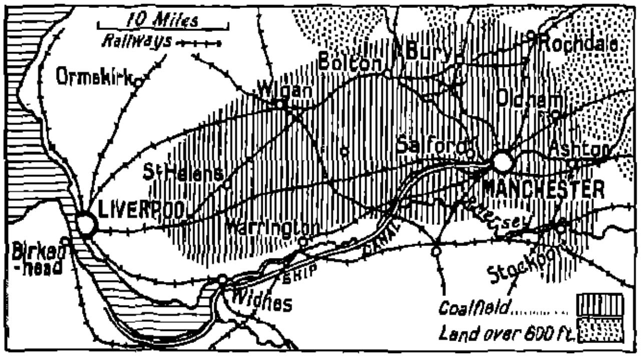


FIG. 85

The Location of the Cotton Industry, showing Chief Towns, Ports, Railways, and Waterways

The class should be reminded from the beginning that the Lancashire region is one of the "lands with coal" (the Lancashire coalfield), and that on this coalfield occurs the greatest cotton industry in the whole world.

Before going into the details of the industry, and the geographical basis on which it rests, it might be advisable to point out, once again, the broad resemblances between the wool industry and the cotton industry—in terms of spinning and weaving, and the making of cotton cloth, cotton clothes, etc.

What Cotton Is

This should be very carefully explained once more, and the great differences between its production and that of wool. (One vegetable, the other animal.)

Cotton is simply the fluff found on the seeds of the cotton plant, inside the cotton pod. This pod is the fruit of the cotton plant.

At this point the class should be reminded of their past lesson on "The cotton lands of the Southern States of the U.S.A." But the young teacher should remember that it is often surprising what young children are able to forget in a short time. Hence it is better to go quickly over the details they have already received on the production of raw cotton.

Where the Cotton for the Cotton Industry of Lancashire Comes From

Any cotton-growing region could be taken in order to revise particulars of the production of raw cotton, such as Egypt, India, or the U.S.A. The greatest advantage, however, is likely to be obtained by revising the lesson on cotton growing already received. This is most likely to have dealt with the southern states of the U.S.A.

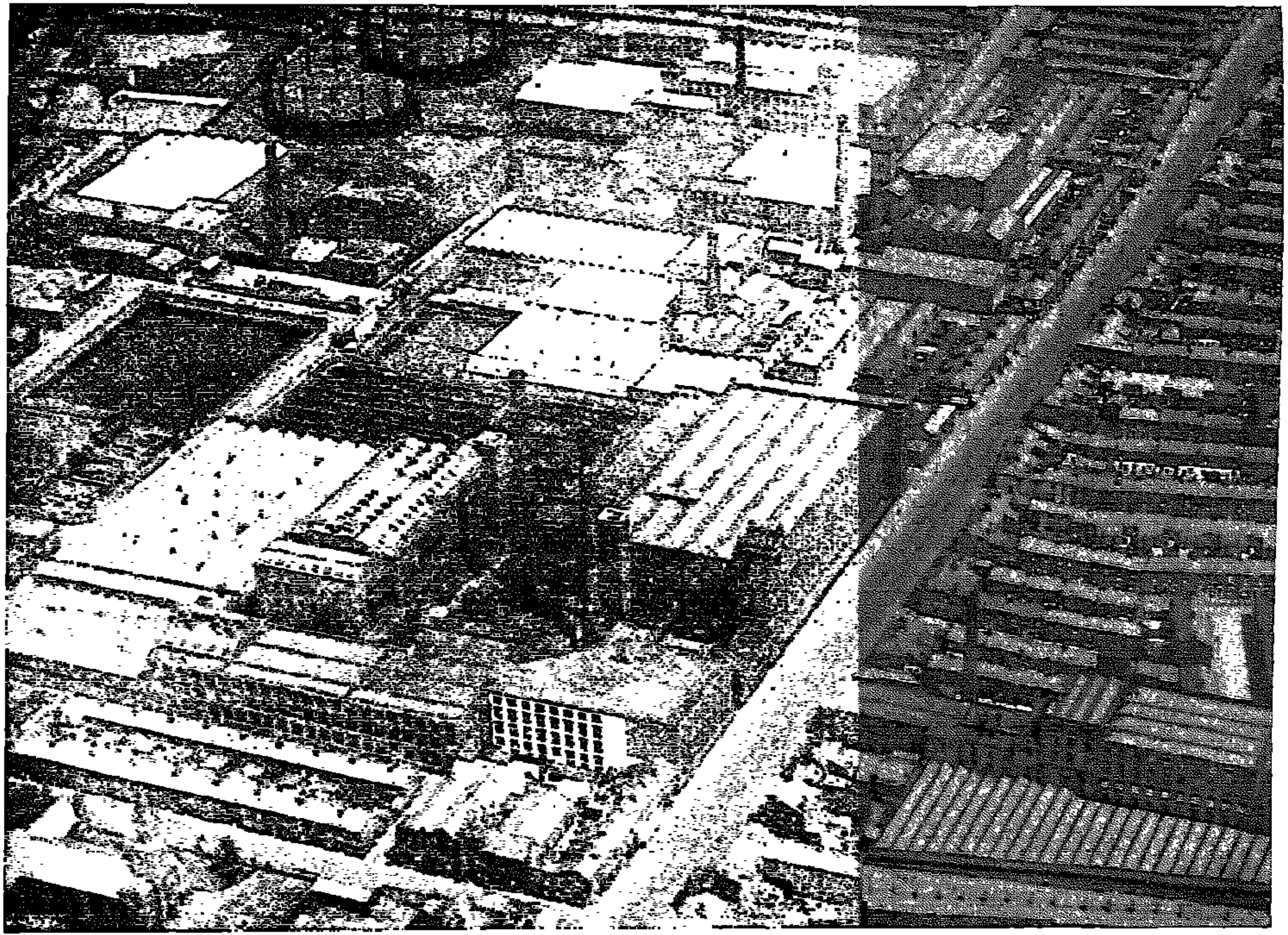
Describe the climate, pointing out the impossibility of growing cotton in a climate like our own. Show pictures of a cotton field, with the cotton ready to be picked or in the process of being picked.

After the labour of the picking, the cotton is "ginned," and packed into bales. Describe what happens to these bales at one of the large cotton ports, such as Galveston or New Orleans.

From New Orleans to Manchester

After describing the loading of the ship at New Orleans with the bales of raw cotton—mainly in terms of the work required to be done by various people—the teacher could take this opportunity to enlarge the child's knowledge of the journey across the Atlantic.

Eventually the ship, laden with cotton, approaches the shores of north-western England. Its terminus is Manchester.

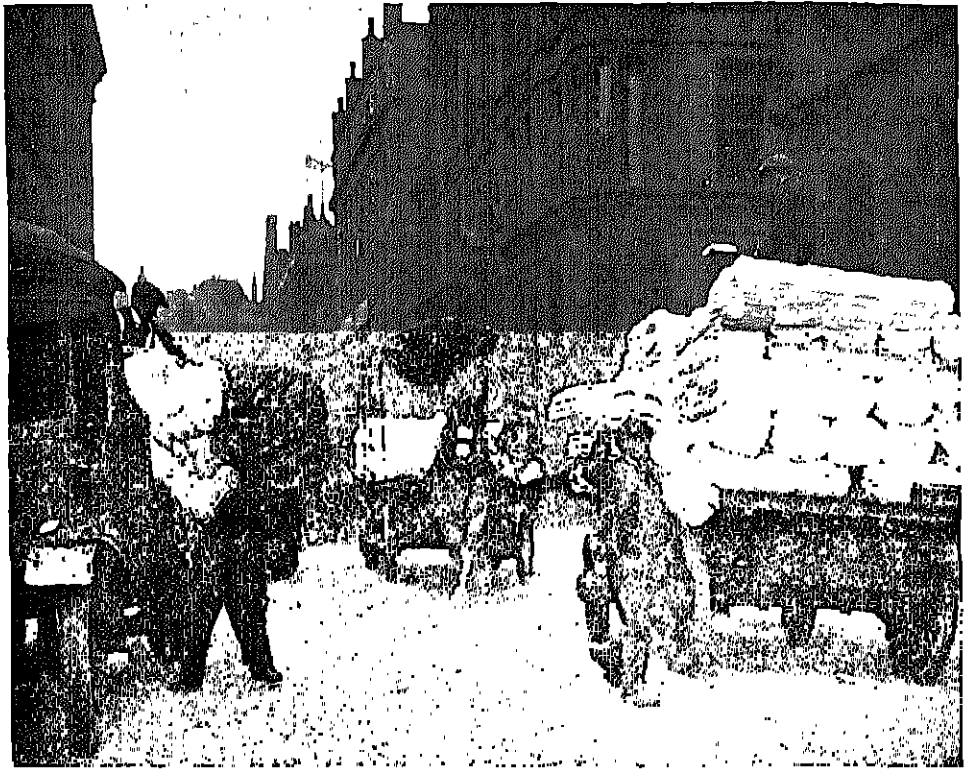


Photograph by Aerofilms, Ltd.

FIG. 86

Cotton Mills, Preston, Lancashire

The Manchester Ship Canal. The ship reaches the great port of Liverpool, and the children would expect it to unload there. This leads up to an interesting talk on the wonders of the Manchester Ship Canal, by means of which Manchester has now been made an important port, many miles from the sea.



W. F. Taylor

FIG. 87

Bleached Cotton Arriving at Warehouse, Manchester

(It has just come from the Cotton Mill.)

Manchester. The cotton is unloaded at the docks of Manchester, which is the great market centre for raw cotton. Manchester is the largest town of the cotton industry of Lancashire. Let the children notice its position on the map—surrounded by "cotton" towns, and joined to them by a network of railways.

The Cotton Industry of Lancashire

The children should receive some elementary ideas concerning the reasons for the localization of the cotton industry in Lancashire. But care must be taken that these reasons are *true.* A partial explanation is the dampness of the atmosphere of this part of England, due to its position on the windward side of the highlands (rain-bearing winds from the west). This was useful in the past, because the slender threads break easily in a dry atmosphere. To-day, artificial dampness is given to the atmosphere of the cotton mills.

The rainfall suggests another reason. The rain falling on the western flanks of the Pennines ran off the impervious millstone grit of the higher moors, and gave a clean, pure water, very suitable for dyeing and bleaching. Hence, the group of towns up in the moors, each on a stream, and specializing in bleaching and dyeing.

Such large towns as Bolton, Bury, Rochdale, and Oldham form a lower ring of towns. Each of these lies on the lower courses of the rivers, where the plain begins. At these towns are to be seen the large mills for which Lancashire is so famous.

The above points all emphasize the central importance of *Manchester*, which is also the centre of the river systems.

Spinning and Weaving. These processes should be explained mainly by means of pictures, and some idea should be given of the marvels of some of the machinery, e.g. one man or woman being able to look after a spinning machine that spins thousands of threads at once.

After these details have been explained and demonstrated, it should be pointed out that, as in the wool industry of Yorkshire, so the towns of Lancashire tend to specialize in the various processes of the manufacture of cotton goods—e.g. spinning, weaving, and the making of different classes of cotton goods.

The importance of coal as the "power" must be emphasized at every turn.

The Life History of a Cotton Shirt or a Cotton Frock

This kind of work makes a good form of revision. Start from the cotton fields of America. Follow out the processes by means of which the raw cotton is turned into a piece of cotton cloth.

From this point keep in mind the "home" town of the children, and follow the course of either the finished article or the piece of cotton cloth from Manchester to the home town.

A Sketch Map, illustrating the geography taught during the lesson, will also act as a reminder of all that has been learnt. Such maps should be drawn by the teacher, using a running fire of revision. Only the broad ideas should be expressed on the map: e.g. the sea and the Pennines; the coalfield shaded; Liverpool; Manchester; the first ring of towns round Manchester; the second line of moor towns; the Manchester Ship Canal and the Mersey; the main railways. Only the facts taken in class should be entered on the map.

When the teacher has made a clear map of the region in the above way, the children should be allowed to make a copy of it, having been told to put in the detail in the same order.

By such means the sketch map can truly become "the shorthand" of geography.

A similar map could be done for the iron and steel industry of the Black Country, and for the wool industry of Yorkshire.

OTHER INDUSTRIES THAT COULD BE TAKEN IN CLASS

Lack of space prevents the inclusion of other industries that have their foundation on a basis of coal, but, if time permits, the teacher could take one or two other important industries such as—

The shipbuilding industry of the Tyne, Wear, and Tees—based on the coal of the Northumberland Coalfield.

The Potteries of the North Staffordshire Coalfield.

The linen industry of Belfast, based on Scottish coal.

(It would be better to leave the linen industry until Ireland is taken in some detail.

Similarly perhaps with the shipbuilding industry, it would be better to wait until a review of Scotland is being undertaken. Then the industry as a whole could be attempted, for the Clyde has the largest shipbuilding trade in the world.)

THE FISHERMEN AND SEAMEN OF THE BRITISH ISLES

As the course on the British Isles progresses, continual rapid revisions should occur—revisions, by a word or two, of the broad features of the human geography, in order that the child may see the relation between the current lessons and those received in the past. The aim is for the child to receive some idea of the unity of the human geography, as well as consolidating the previous knowledge.

For example, in the lesson or lessons on the above title, the teacher might commence on lines similar to the following—

"In the lessons we have had so far, we have seen that, in our own lands, people earn their livings in a variety of ways, according to the region they are living in. Some earn their livings by *working on the land*—either in growing crops, or in rearing animals. Such people are the farmers of the arable lands, pasture lands, and higher lands.

"We have seen also that other people live in a totally different way, some as *miners*, who dig valuable minerals such as coal out of the earth; while others work in the thousands of factories, making all kinds of goods with the aid of machinery. In the last three or four lessons we have studied the work of the people engaged in: the manufacture of *iron and steel* goods in the Midlands; the *wool industry* of Yorkshire; and the *cotton industry* of Lancashire.

"Of course, there are many other industries, such as the making of leather and leather goods, the linen industry, the silk industry, motor-car manufactures, and hundreds of others. There are reasons, if we only had time to search for them, for the position of each of these industries.

"But some people are not farmers, miners, or manufacturers—and do not even work on land at all! Who are they? They are *the men who earn their livings from the sea*—the seamen we might call them." (Pitman Film Strips will be useful.)

After such an introduction, the teacher can then begin the lesson on the fishing industry of the British Isles feeling that it will not be isolated from the previous lessons, and will automatically find its place in the child's mind, as a definite section of the human geography of the British Isles.

A few moments could be wisely taken in a talk on sea-fishing generally, but, as soon as possible, the lesson should be brought to a definite description of one branch of British fisheries, such as the herring fishery of the North Sea.

Centre the industry round the nearest coast town that has anything to do with it: e.g. Yarmouth or Grimsby for London boys and girls; Aberdeen for Scottish children; Cork or Wexford for Irish children.

WITH THE HERRING FLEET IN THE NORTH SEA

First describe the two different types of sea fishing—by *trawler* and by *drifter*. The former is by means of a trawler net that is dragged along the bottom of the sea, with the intention of catching the flat fish, such as the sole and plaice, that live in the mud of the sea floor. A lesson on this was given during the previous year (see page 436).

On the other hand, *the drifter* uses a long net that is kept by means of floats to the surface waters, so that the fish that live near the surface can be caught. Such fish are mackerel, pilchards, cod, haddock, and herring.

An imaginary trip with a drifter should be taken by the class, the experience being made as vivid as possible by the description of the teacher. The chief points to bring out are the details of the everyday life on board such a ship—the letting down of the nets, the dragging, and the final gathering of the "harvest of the seas." At this stage the teacher should try to obtain a good description of the freshly caught fish themselves, as they lie in a gleaming, twisting mass, all kinds, shapes, and sizes, but mainly herring.

What Happens to the Catch at the Fishing Port

The rapid steam for home after a good catch, and the unloading of the fresh fish should be described in detail.

Then the fish go to the market, if that is not on the shore, and are sold by auction. Some of the fresh fish are sent by rail to the fish markets of the large towns, such as Billingsgate Market in London, the largest fish market in the world. But, with the herring industry, much of the fish is dealt with at the various fishing ports, as soon as it is landed.

The herring fishery is a very important one for the fishing ports of the east coast of Britain.

Some of the most important of these ports are Wick and Aberdeen in Scotland, and Whitby, Hull, Grimsby, Lowestoft, and Yarmouth in England. Notice that all face the North Sea.

One peculiarity of the herring fishing of the North Sea is that the herring appear in great shoals that move in a definite direction, and appear only at certain times of the year. They first appear off the coast of north-east Scotland, and gradually move south, taking months to do the journey. Eventually they reach as far south as Yarmouth, and the herring season is then almost at an end.

As the shoals of herring move south, the fishing fleets from each of the fishing ports send out their ships as soon as the shoals are in the neighbourhood. They usually gather a good harvest.

The Scottish Fisher Girls

These hard-working people are an attractive subject for a lesson on what happens to much of the herring, while at the same time the movement of the herring shoals southward is emphasized.

Pictures should be shown of the Scottish fisher girls busy at work at any one of the herring ports during the season. The picture sheets of the daily newspapers make a feature of this every year.

A few words of explanation will suffice, for the pictures of the dexterous slitting and cleaning of the herring and of the packing of the barrels speak for themselves.

A word on the curing of herrings in order to make "bloaters" and "kippers" would not be out of place, as these articles of food are very popular in many of the children's homes.

Why the Seas Round our Islands are Good Fishing Grounds

A short explanation of this (as given on page 436) forms a valuable finish to the study of the fishing industry, and is useful revision.

In pointing out the comparative shallowness of these seas in terms of the 600 ft. contour of

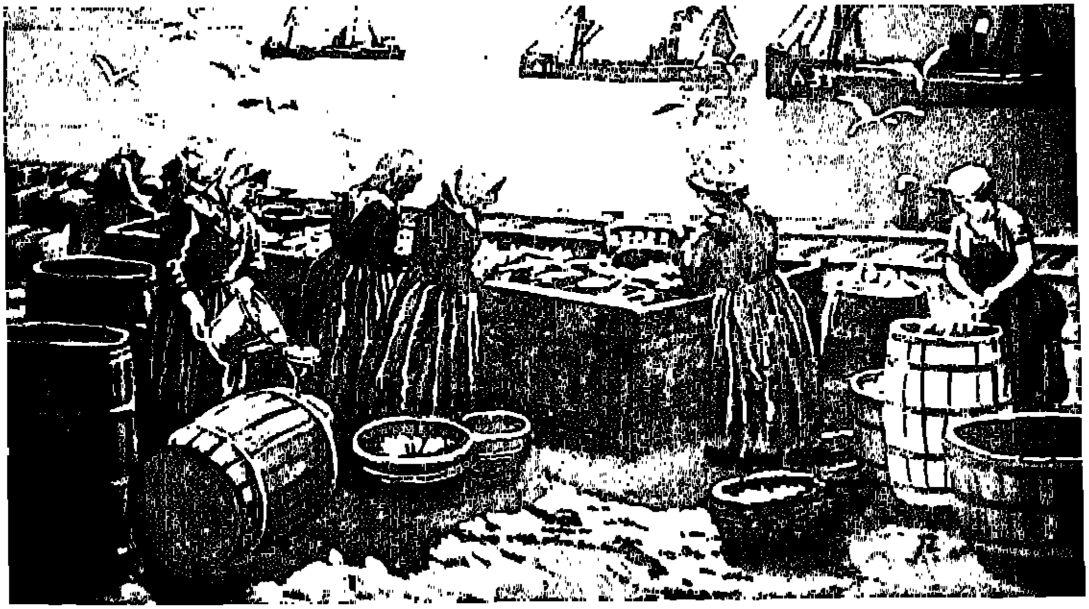


FIG. 88

Scottish Fisher Girls Cleaning and Packing Herring on the East Coast the bottom of the sea, there is no reason why the term "continental shelf" should not be introduced to the older Juniors.

Similar shallow seas could be pointed out, such as those off Newfoundland and Japan.

Other Seamen of the British Isles

The lesson on the fishing industry leads naturally to the lives of other people who earn their livings on the sea. If these people do not fish, what do they do? What kind of work is done by men who earn their livings on board ships of various kinds, such as on a tramp steamer to West Africa or on a large liner to New York? What work is the ship doing or going to do?

Such questions will soon show the class the correct line of thought, and a description of the work of these seamen and its importance to the British Isles and the British Empire could be attempted.

British Seamen through the Ages would provide an interesting title for a talk showing the connection between history and geography, and would give a preliminary understanding of the origins of the British Empire, which in many respects could be said to have been based on sea trade.

An expansion of the above could be made so that the children appreciate the insular character of their homeland—the "precious isle set in the silver sea," and the importance of this insularity in history. This could be illustrated by a reference to the Spanish Armada, to the attempted invasion by Napoleon, and to the German submarine campaign in the late war.

OUR SEAMEN AND THE MAIN TRADE ROUTES OF THE WORLD

A map of the world, preferably showing the British Commonwealth, could be made the basis of a very interesting illustration of the important work of the seamen of the British Isles. A rapid survey (and revision) of the origins of our food, clothes, and shelter, and other commodities of everyday life, by following their routes across the seas, would help to consolidate the ideas of the children, as well as their geographical knowledge.

The Importance of Good Harbours and Ports

Although it may seem as if too much detail is being attempted in this part of the course, it has been done intentionally because it helps *to introduce* the child to so many geographical features of our own lands. These features are learnt in a more interesting and striking manner by these means than they would be if isolated, formal lessons on them were attempted. Also, time is too short to cover all the details of the geography of the British Isles—in formal lessons.

A chat on the importance of good harbours and ports to men who earn their livings on the sea obviously tempts the teacher to take the class for a brief survey of the coasts of the British Isles, in order to see how suitable or otherwise they are for ships.

In this way the children will become acquainted with all the large openings and estuaries, and the ports on them. Their attention should be particularly concentrated on the mouth of the Thames, the Humber, the Tyne ports, the mouth of the Forth, Aberdeen, the mouth of the busy Clyde, the mouth of the Mersey (contrasted with the mouth of the Dee) and the mouth of the Severn. In this survey of Britain as a whole, they should notice the positions of the more important ports, especially London, Liverpool, Manchester, Glasgow, and Hull.

Turning to Ireland, a similar but less detailed survey should be made, and the positions of important ports such as Belfast, Dublin, and Cork should be noticed, and the reasons for their importance.

A comparison of West Coasts and East Coasts could then be made. The east coasts are the more important. (Why?)

This leads to a talk on the character of the rocky west coasts of Scotland and Ireland, and a comparison with the lower coasts of the eastern sea border of Britain. (Note that the character of the west coasts of Ireland and Scotland is due to the sinking of the region in times past, and the consequent flooding of the river valleys.) Use the population map, and let the children appreciate that, as there are very few people living in, say, the western regions of Scotland, no large ports would be required or could grow up there. Ships bring goods where they can be sold easily. In this respect, notice again the positions of London, Liverpool, and Glasgow — as feeders of heavily populated regions.

WALES

The class has already received some information and a few ideas on the human geography of Wales as a whole—during the lessons on the highlands and lowlands, the sheep-lands, and the lands with coal of the British Isles. This knowledge should be revised and followed by a lesson on Wales itself, or more than one lesson if Wales is the homeland of the children.

General Introduction

The preponderance of highland and the position of the chief lowlands should be noticed. The course of the Severn valley should be followed from source to mouth, leading to a talk on the "borderlands" of Wales and their importance in the past. The positions of the key towns of these borderlands should be noticed—towns situated at a commanding spot in a river valley or at the head of a good route on the lowlands.

The positions of Chester, Shrewsbury, Hereford, Gloucester should be particularly studied. But, although these towns are no longer important from the military point of view, yet their positions still make them nodal centres, and they are to-day important agricultural market towns. Notice their positions with regard to the roads and railways.

Routes into Wales

The positions of the border towns mentioned above illustrate the importance of the river valleys as routes into and out of Wales, from England.

However, from the map, the children will be able to see that the two most important routes to-day, as in the past, are the north-coast and south-coast routes, leading to Holyhead and Fishguard respectively.

Let the children look on these two termini of rail, road, and ship also as important stations on the routes from England to Ireland—not as *ends* of routes.

The Wealth of Wales

A study of the chief items of wealth of a country usually tells us by what kind of work many of the people will be earning their livings.

In most parts of Wales very few people live. (Why?) But certain regions are very valuable, and, hence, help to support many people, by means of the work they provide.

Briefly, the wealth of Wales consists of—

1. The enormous *coalfield* of the south, where a large proportion of the people of Wales live.

2. The valuable quarries of *slate* in North Wales, e g. at Bethesda.

3. The *beauty spots*, such as Snowdonia, and the holiday resorts of Llandudno, Rhyl, Colwyn Bay, Aberystwyth, etc.

4. The *sheep* of the sheep-lands, and the *cattle* of the rich pasture lands of Anglesea and the lowlands.

The above summarizes the most important topics that could be taken with advantage in the Junior School. After such a survey of the geography of Wales, it is possibly better to concentrate on the most important item, treating the others in less detail.

The South-Wales Coalfield

Undoubtedly, this is the most important region in Wales from the economic point of view. The population map brings this out immediately. Emphasize the point that it is the most important region because most people live there, and most people live there because most employment is to be found there. This is due to the valuable seams of coal that lie under most of South Wales.

The work of rivers could be introduced

briefly at this stage. The many rivers flowing south down the mountains to the sea are short and swift; hence their strong cutting power. Long ago they cut through the rocks overlying the coal, until coal was exposed in the valleys. Hence the coal at these places was most easily obtained, without the huge expense of pits and the corresponding machinery. To-day, of course, things are different.

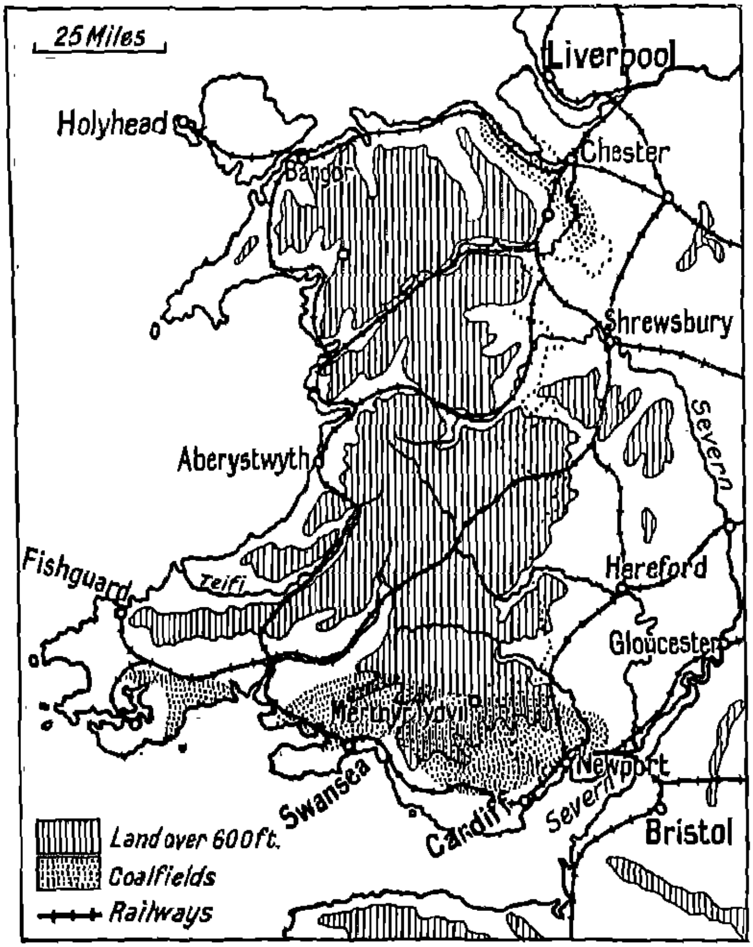


FIG. 89

Wales, showing Highlands and Lowlands, Chief Routes, Coalfields, Chief Towns and Ports

Not only are there large coal resources in South Wales, but the coal is particularly valuable because it is a special kind, called *anthracite*. This is a smokeless coal, and is in great demand for slow-burning stoves and for steamers and battleships. Much of it is exported to all parts of the world, largely for the use of ships.

Ports

Notice the positions of Cardiff, Swansea, and Newport. These are the important coal ports of South Wales. But, as well as *exporting coal*, they import enormous quantities of foodstuffs for the people, and large quantities of timber to be used as pit-props in the mines.

The Iron and Steel Industry

On the northern edge of the coal belt, valuable deposits of iron ore were found at the beginning of the Industrial Revolution. The coal and iron ore being together caused an iron and steel smelting industry to arise.

To-day the region is famous for its "tin" goods. These are not made of tin, but of thin sheets of "mild" steel covered with a wash of tin to prevent the steel from rusting. Dowlais, Merthyr Tydvil, and Llanelly are the most important towns of these industries.

SCOTLAND

Another journey to Scotland, and across it from South to North. In an earlier lesson the children were taken to Scotland, to obtain some general ideas on the types of regions passed through. The aim now is to give a suitable introduction to a more detailed study of Scotland.

Make a journey to Scotland by a route different from that of the previous lesson. For example, if the Great North Road was taken, follow the route via Carlisle on this occasion, revising the past geography lessons on the way.

Carlisle to John o'Groats by way of Ben Nevis and the Caledonian Canal would help to provide an interesting means of introducing the class in a broad way to the three main natural regions of Scotland. These should be clearly visualized by the children, not only from the map, but from the point of view of the life and work of the peoples who live in each of them.

The three natural regions are—

1. The Southern Uplands.
2. The Central Valley (the Rift Valley).
3. The Highlands.

The above natural divisions make an excellent basis for a rapid study of the geography of Scotland. Each should be taken in turn, but most of the emphasis should be placed on the Central Valley, where most of the Scottish population live because of the peculiarities of the region.

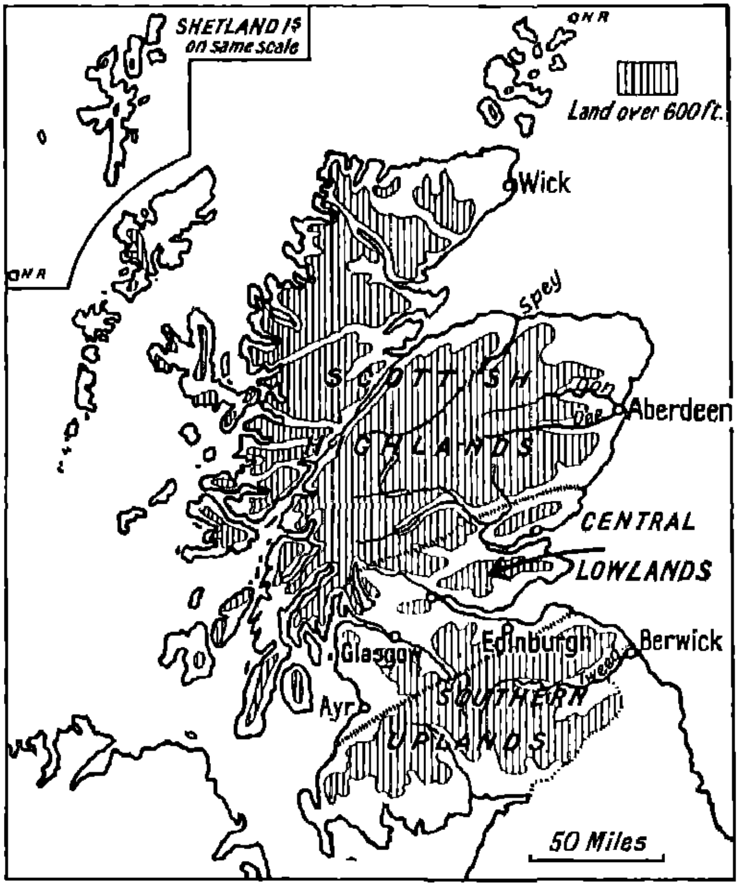


FIG. 90
Physical Map of Scotland showing the Three Main Divisions

1. THE SOUTHERN UPLANDS

On the physical map these highlands have the appearance of a continuation of the Pennines, which the class has already understood to be a mass of *upland*, rather than a line of mountains.

Notice how the rivers have cut up the region, and let the children trace the course of them with a finger or pencil. There is usually a town or village at the entrance to the valley. Dumfries, Hawick, Galashiels, and Peebles are four such towns situated in the valleys or "dales" as they are called.

Sheep-lands and Shepherds. This part of Britain has always been famous for the sheep reared there. These Scottish Uplands are one of the most important of the sheep-lands of Britain. Describe these *moors*—no trees, heather covered in many parts, and very bleak at most times of the year, except in the sheltered valleys or dales.

Compare the lives of the people of the sheep-lands with those of the sheep-land people of the Pennines. Revise the particulars of lambing and shearing times. (What happens to the wool?)

Like Yorkshire, this region is also the centre of a wool industry, although not to be compared in the quantity produced. The teacher might very suitably at this point take such a name as "Tweed" in terms of cloth, to give some idea of the wool industry of such long standing that the original region has given its name to a particular kind of cloth, whether now produced in the Tweed Valley or not.

2. THE CENTRAL VALLEY OF SCOTLAND

Unless the children are in Scottish schools, in the Junior course on the British Isles it will naturally be impossible to give many lessons to Scotland. But the pupils in all schools should realize that the important region of Scotland is the region of lowland (crossed by ranges of low hills) between the high mass of the Highlands to the north and the lower mass of the Southern Uplands to the south.

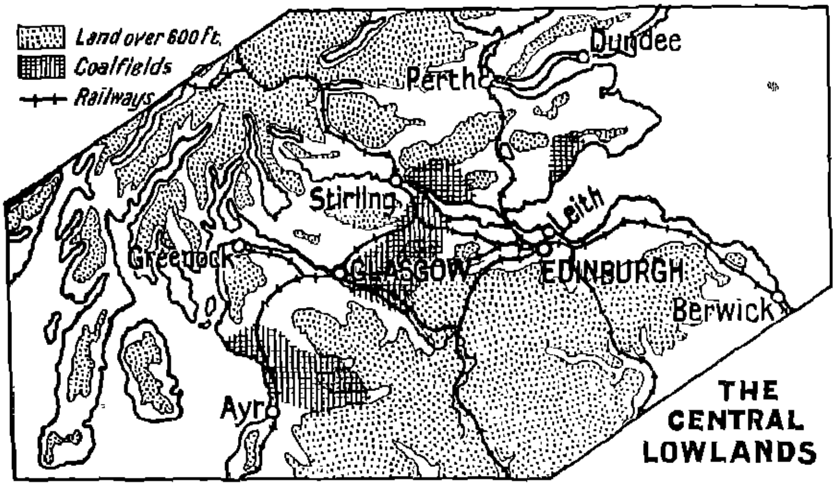


Fig. 91

The "Rift" Valley. This Central Valley of Scotland was formed in time past by the formation of two large faults, one to the north, and the other to the south. The land between these two faults gradually sank, and a "rift" valley was formed.

(Such a description helps the child to remember the unique characteristics of the Central Valley in having a life totally different from the other two regions. It helps to keep the idea of the Central Valley as something separate and isolated from the rest of Scotland, and thus helps him to appreciate and remember its importance.)

Rivers and Estuaries. A short concentration on these helps to emphasize the peculiarities of the region physically. Notice the wide estuaries of the Clyde, Forth, and Tay, and follow the course of each of the rivers that flow into them.

Notice the canal joining the Clyde to the Forth.

Towns and Ports. This is the region of most towns in Scotland. The positions of Glasgow and Edinburgh should be noticed particularly.

Glasgow is the largest town and the most important port of Scotland.

The Population Map of Scotland. This shows very clearly that more people live in the Central Valley than in any other region. Why is this?—

1. It is the region where there is most lowland, and where the climate is not too bleak for agriculture. In this region lie the most fertile spots in Scotland such as the famous Carse of Gowrie. Hence, even in times past people would have tended to settle there rather than in the higher or less fertile regions.

2. The most important reason to-day is the same as that which makes certain regions in England so populous, namely, it is the one region of Scotland that possesses "Lands with Coal."

3. Because of the valuable coal resources, this is also the great Industrial Region of Scotland, where iron and steel, cotton, and wool factories, as well as many other of the common industries have grown up.

How Coal came to be in the Rift Valley. A short sketch should be given showing how the coal measures were preserved by the sinking of the land and the ultimate covering of it by other layers. In other parts of Scotland if there has ever been any coal it was gradually removed by the action of the elements.

The coal in the Rift Valley remained for thousands of years protected—waiting for the nineteenth century when coal became king.

The Scottish Coalfields. The map of the coalfields of the British Isles (Fig. 77) shows these clearly. There are three main fields in Scotland, running from west to east across the Central Valley. They are the Ayrshire, the Lanarkshire, and the Fifeshire coalfields

Each of these supports large industries, and has many large towns. Notice particularly Ayr and Kilmarnock, Glasgow and Lanark, and Edinburgh—on or near one of the coalfields.

Industries. All the ordinary industries are carried on in the factories of the towns on these coalfields of the Central Valley.

Woollen Goods at Stirling and Bannockburn, while Ayr and Kilmarnock specialize in Kidderminster carpets.

Linen goods at Dundee. Note also rope, sails, coarse bags, and cheap carpets of hemp and jute (from the mouth of the Ganges).

Cotton goods at Glasgow and Paisley (notice the position on the west in terms of the U.S.A. raw cotton, *cf.* Liverpool).

Iron and Steel Goods and Machinery are made in large quantities on the Ayrshire and Lanarkshire coalfields. Glasgow imports large quantities of iron ore for the iron and steel works in its neighbourhood. Note the famous Carron Iron Works in Stirling

The Shipbuilding Industry of the Clyde

Just as the main coalfields of England and Wales have a typical industry more important than any other, so has the Clyde region (natural centre, Glasgow)

The River Clyde has the largest shipbuilding trade in the world. (Remind the class of the shipbuilding on the Tyne, Wear, and Tees—these three regions taken together form a much larger industry than that of the Clyde.)

Briefly the reasons for the localization of the industry in such a place as the Clyde are—

1. The presence of coal and iron ore together in easily worked quantities.

2. The excellent natural protected waterway that leads into the heart of the coalfield.

There are about twenty miles of shipbuilding and engineering works along the estuary of the River Clyde.

Pictures

1. By means of pictures try to give the child some ideas of how modern ships are made, such as the giants of the Atlantic, which are really floating palaces—with every convenience that the best of hotels could provide. Give a fairly full account of these conveniences, so that the children may realize what a wonderful feat of work and engineering the modern ship is. Some pamphlets obtained from one of the large shipping companies would show sections of the ship and pictures of the type of accommodation provided.

2. Obtain pictures that show how a ship is made—the dry dock, the scaffolding surrounding the growing ship, the launching, etc.

Materials Required for Building a Modern Ship

Let the class attempt to give a list of the majority of the raw materials required in the making of a ship, and try to follow the origins of these materials as far as the Clyde industry is concerned.

Note particularly timber, iron and steel, and machinery. Notice the enormous number of people who are employed when a mighty ship costing more than a million pounds is made in the shipbuilding yards of the Clyde.

Glasgow is the capital town and industrial centre of the Clyde industries—shipbuilding, iron and steel, machinery, cotton goods, woollen goods, etc.

Notice its position on the map. It is the point on the Clyde where the river was first bridged. Roads and routes lead to this spot from all directions. It is the natural centre of the district. Coal and iron are near it, and this has helped in the last hundred years to give Glasgow enormous impetus. It faces toward the industrial region of North Ireland, as well as the Americas.

It is at the head of a very valuable waterway—the Clyde. All these things have helped a large city to grow up on the site of Glasgow. It is the second largest city in the British Isles, and is the seat of many industries (notice Greenock—its port to-day). Compare its position and importance with that of London.

Edinburgh is the capital of Scotland. Because of its position it rose to importance in early times. It is on the east-coast lowland, on one of the main routes from England to Scotland. It is built on a high hill (Edinburgh castle), and from there the town could be easily defended. It is an important railway centre to-day, routes from England and across the Southern Uplands leading to it. Note the Forth Bridge built a few miles from Edinburgh.

Leith is the port of Edinburgh.

The positions of such towns as Stirling, Perth, and Dundee could also be discussed if there is time.

3. THE SCOTTISH HIGHLANDS

These could be taken as a single region. Their general characteristics of lonely mountain, bleak moor, and beautiful lakes could be described with the aid of pictures.

Routes should be noticed carefully in terms of those taken by the railways, and the value of the highlands as a holiday and sports centre could be illustrated.

The names of the most important features should be introduced, such as the Caledonian Canal, Ben Nevis, the Trossachs and the lakes, the Hebrides, etc.

How much detail is taken of Scotland outside the Central Valley will depend on the time at the teacher's disposal, but, in any case, the proper perspective should be given to the child by giving most time to that most important region. At the same time the teacher should try to give the child the idea of the country as a whole, so that he does see it as a unit.

IRELAND AS A UNIT

As time is short, and the children are young, too much time cannot be given to Ireland. In planning the course as a whole the teacher should decide at the beginning of the year how many lessons he intends to give to each of the countries of the British Isles, proportioning the time according to the economic importance of the countries concerned. (An exception to this is likely to be made for sentimental reasons, perhaps rightly so, where the country of the school is not England.)

The general method of procedure with Ireland will be understood from the previous pages, and here is given only a suggested list of items to be studied in the classroom—

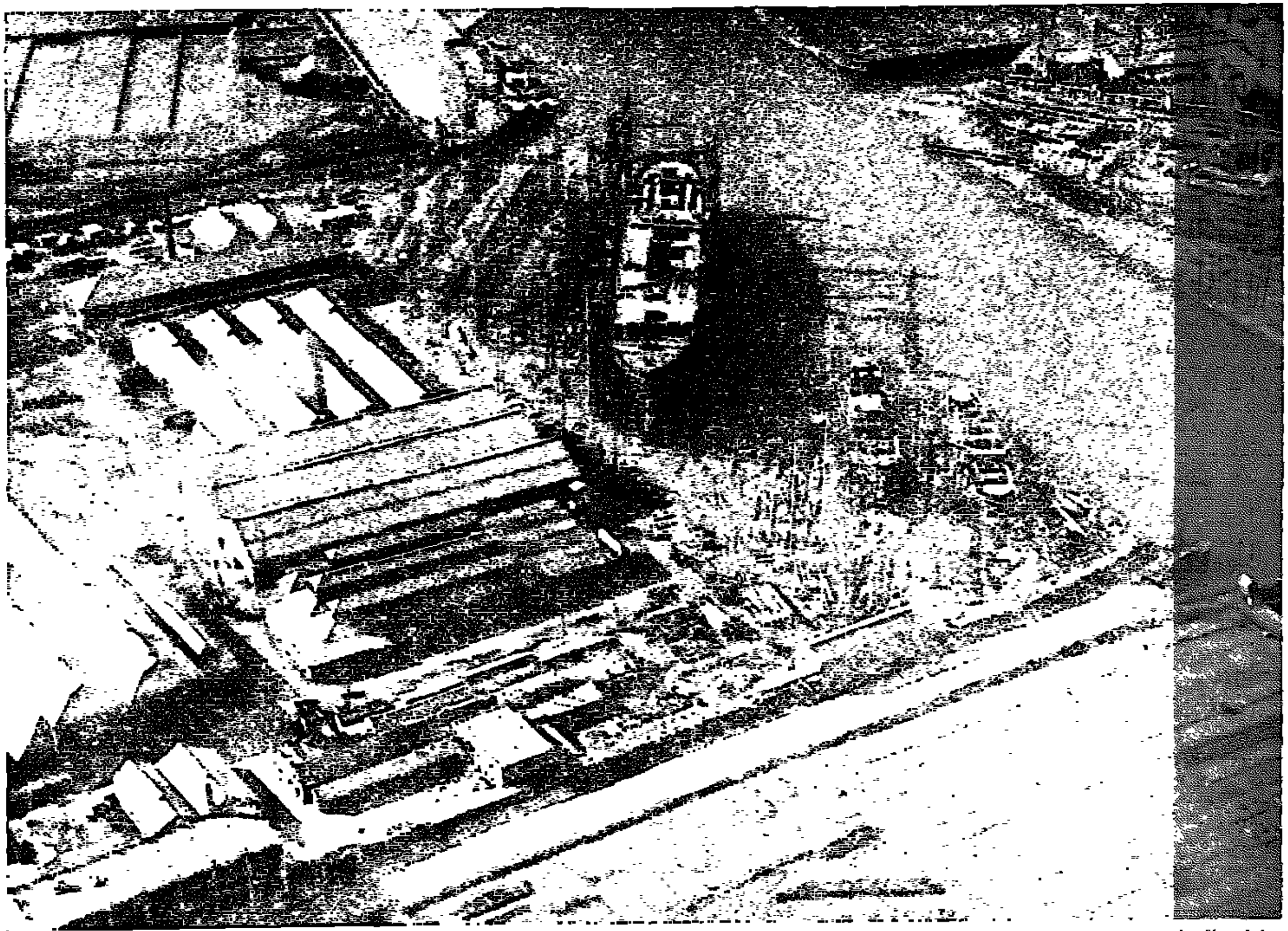
Ireland as a whole. Its position in connection with Britain and Europe (and America).

Highlands and Lowlands. The Great Central Plain.

Important rivers and lakes.

The climate revised. Its general mildness and wetness. The "Emerald Isle."

Then might come a detailed survey of the main industries. As Ireland is essentially an



Photograph by

Aerofilms, Ltd.

FIG. 92

Shipbuilding on the Clyde : a Shipyard near Glasgow agricultural country, this aspect should be concentrated on, possibly under such a heading as

The Cattle-lands and Dairy Farming of the Irish Plain.

Towns and ports would be treated in terms of the products and their marketing. Note particularly the positions of the ports on either side of the Irish Sea, and the export of animal products to England.

Political Divisions

The course on the British Isles would be incomplete if no mention were made of the two separate political states in Ireland, namely, the Republic of Eire, and Northern Ireland. Eire is now a self-governing republic. The lesson on the cattle and dairy farming industry would apply mainly to this republic.

Northern Ireland. Its connection politically (as a member of the British Commonwealth) and geographically should be pointed out, and the teacher should then take as the important industry the linen industry.

The Linen Industry of North-West Ireland

This should be dealt with on the lines already used in discussing the main manufacturing industries of the British Isles.

It should also follow on the lines taken during the previous year's course, where the origins of "Our Food, our Clothing, and our Shelter" were traced from the raw material to the consumer. Note—

1. *Flax,* what it is and how obtained. Linen is made from a vegetable product. Compare this with cotton, hemp, and jute. What are the animal products that are used in a similar way? (Wool, camel's hair, etc., and silk.)

2. The coal for the industry comes from Ayrshire. Ireland possesses hardly any coal. Notice the convenient position of the region for obtaining coal from Scotland.

3. The waters of the region are particularly suitable for the linen industry in their powers of helping the bleaching process.

Belfast. Its position and importance should receive attention. Notice particularly its position with regard to the Scottish coal, and also with regard to Glasgow and Liverpool.

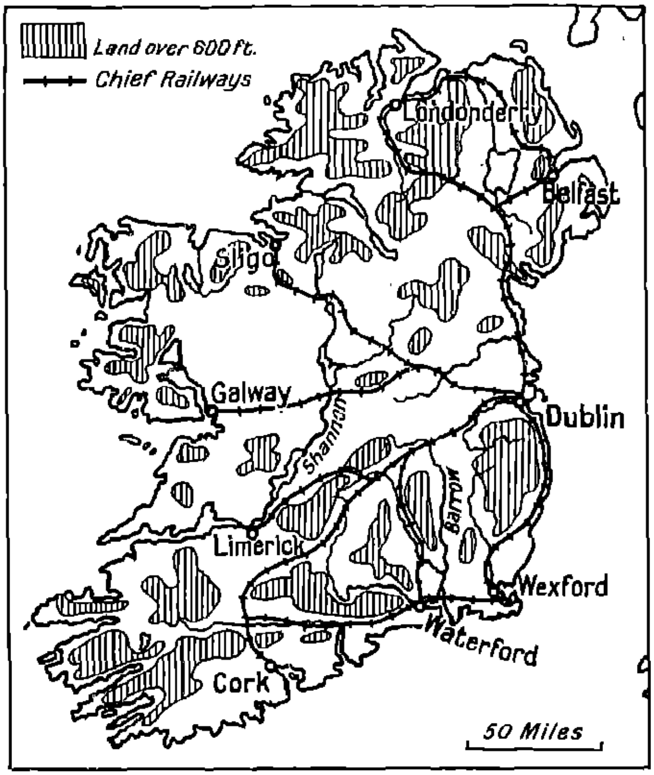
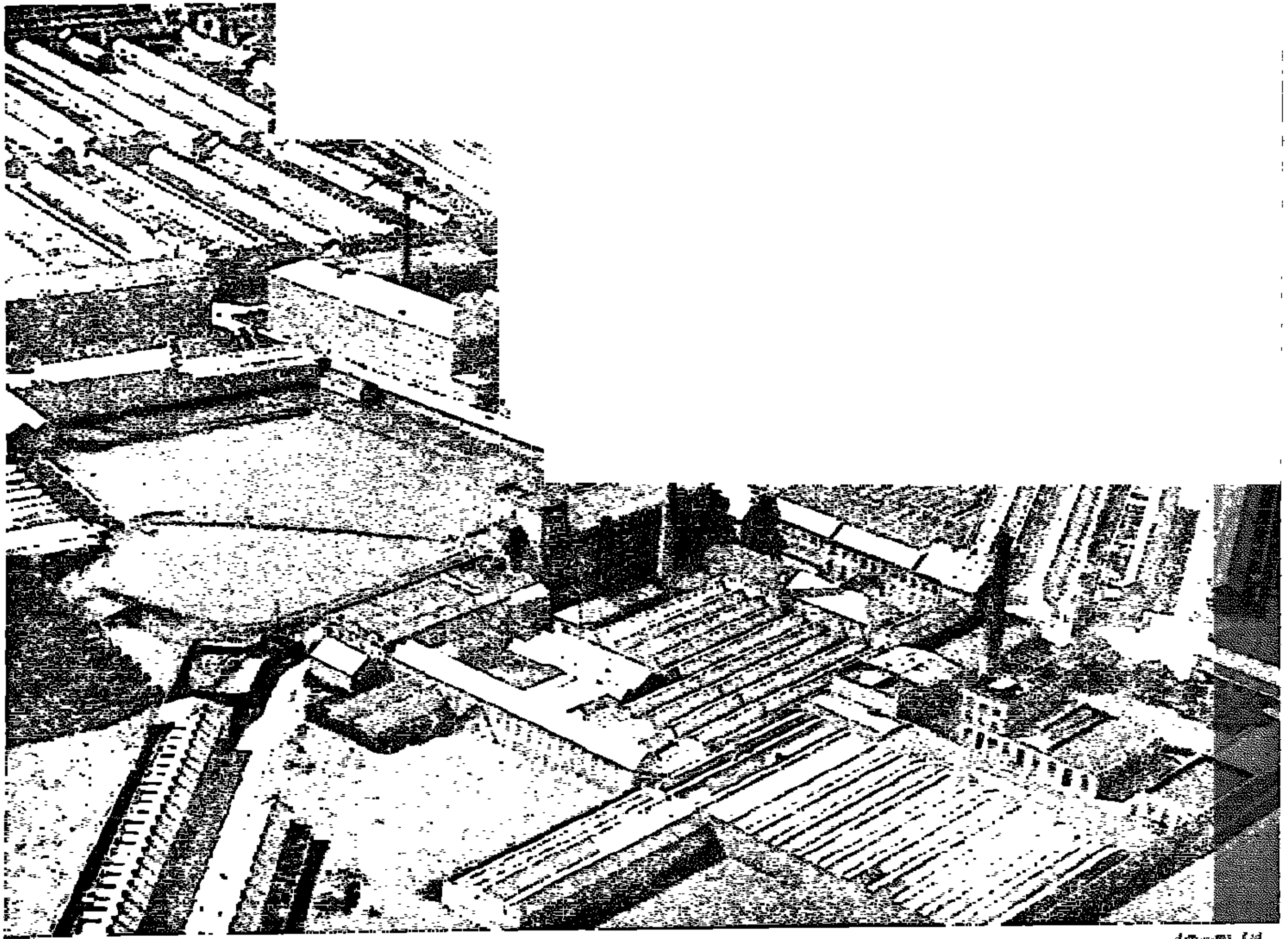


FIG. 93

The Physical Map of Ireland, showing the Main Towns, Ports, and Railways

The Shipbuilding Industry of Belfast

As this type of industry has already been taken in terms of the river Clyde, the shipbuilding of Belfast could be used as a revision of the industry generally (of course, only the teacher



Photograph by Aerofilms, Ltd.

FIG. 94

Linen Factories in Northern Ireland

will know that this is being done). Pictures of the Belfast yards should be obtained, and the lesson and revision worked round these.

Railways of Ireland

A study of these helps to make a unit of the country from the Junior School point of view, and is especially valuable where little time can be given to the country in the syllabus. It can be made to introduce the children quickly to the most important towns and ports so that when they leave the Junior School there will not be the cry so often heard that "they don't seem to know any geography," merely because they do not appear to have heard of, say, Dundalk in Ireland, Arbroath in Scotland, Plynlimmon in Wales, or Buxton in England.

A survey of the railways of each of the countries of the British Isles can be made to serve two purposes—

1. Their geographic position and geographic importance can be noted.

2. They can be made to act as a good revision of place knowledge.

In Ireland notice particularly the radiation of the railways from Dublin toward the south, south-west, west, and north, and the positions of Cork, Limerick, Galway, Belfast, Londonderry, Wexford, and Waterford.

RAILWAYS OF BRITAIN

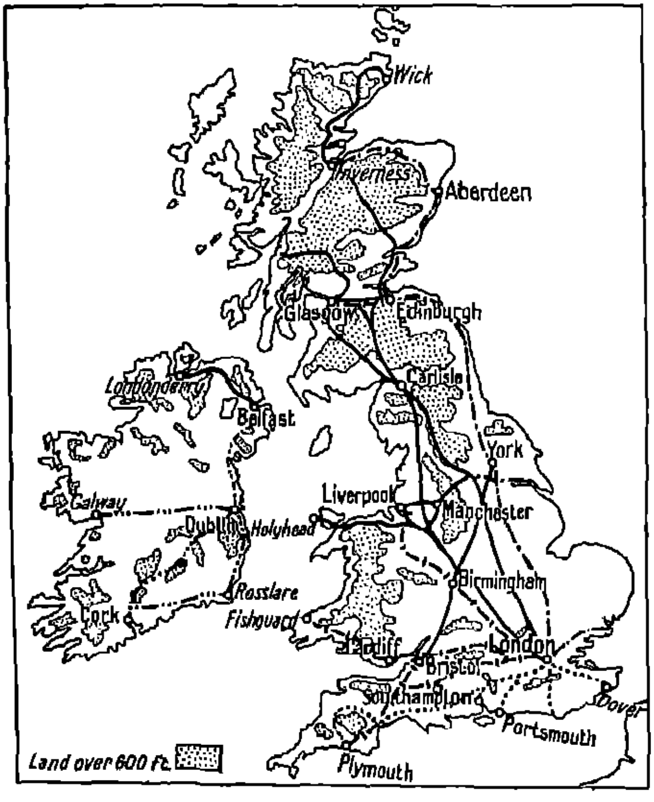


FIG. 95

The Main Railways and Important Towns and Ports

Most of the geography of the British Isles necessary for the Junior School has been covered in previous pages. But there are still two rather important topics that could be taken with great advantage. One of these has already been touched upon during the suggestions on the railways of Ireland, but it must be amplified a little in terms of the railways of Britain.

At some time, preferably toward the end of the course, the railway system of Britain should be taken in some detail. Only the main lines should be attempted, but these should be followed out carefully in order that the child may appreciate that the easiest route has been taken, and that railways will not be built unless there is a reasonable traffic that will pay the expenses of them.

The four main lines are—

The London, Midland Regions with a terminus at Euston.

The Eastern Region, with a terminus at Liverpool Street.

The Western Region, with a terminus at Paddington.

The Southern Region, with a terminus at Waterloo Station.

The North-Eastern Region, with headquarters at York.

The Scottish Region, with headquarters at Glasgow.

Let the children notice the chief towns on each main line and recall the main industry of each large town and the region around.

Notice the network of railways that concentrate on each large town from all directions, as in, say, Birmingham, Manchester, or Glasgow.

This leads naturally to a discussion or lesson on the hub and terminus of all the railways—London, the largest city and the most important in the British Isles and in the whole world. This is the second of the important topics left to the end of the course.

LONDON

To young Londoners, as well as to others, should be given some appreciation of the wonders of this mighty city. To non-Londoners this is a fairly simple matter—the mere description in detail of the wonders of the transport system of underground, on-the-ground, and over-the-ground railways usually sets their imagination working.

Air views are likely to be of great value here, as they can show parts of the terrible conglomeration of houses and buildings that go to make up the wonder city. Some air views should show the Thames splitting the city in two, and the many bridges (roads) that join the two halves.

London and the Thames. A lesson on London would possibly tempt the teacher to trace the historical growth of London from the time when the Thames was first bridged at the head of the estuary at London Bridge. Such a method of approach would be of great value in studying the origins of towns, in the future geographical studies, and would help the young child to realize that he can find very important reasons for the growth of a large town in any particular spot, if only he has the necessary knowledge.

The London Docks should be described in terms of the ships and the cargoes they bring from all parts of the world.

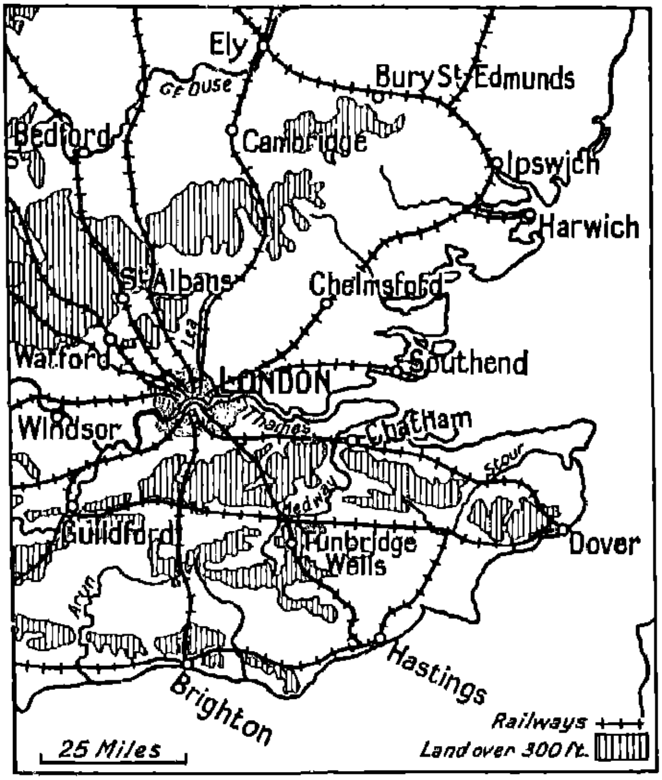


FIG. 96

The London Region, showing London as a Great Centre of Railway Routes

The famous buildings should receive some attention (and should not be mentioned at all unless the teacher can show pictures of those mentioned).

But the attractions of London are so many that it will be best to leave the details to the discretion of the teacher

One point further must be emphasized, and that is the use of the map on every occasion where this can definitely show London's importance.

For example, quite a small map shows that London is the hub of the routes of Britain, especially as a railway terminus.

Larger maps will show that it is also a hub for main roads—the Great North Road, the Great West Road, and the main roads leading to the east and south coasts.

It is also a terminus of air routes. Croydon aerodrome should be particularly mentioned, with a word on one or two famous air voyages that have commenced from there. Give an account of the regular air service to the continent of Europe, and the Air Mail to all parts of the world. All routes meet at London—sea routes, river routes, roads, railways, and air routes.

Pictures

So many pictures of London are available that it will be a question of what to leave out rather than what to include. The teacher should keep in mind that for the present purpose each picture should have some geographical value. Try to obtain some pictures illustrating the many industries by means of which the millions of Londoners earn their livings.

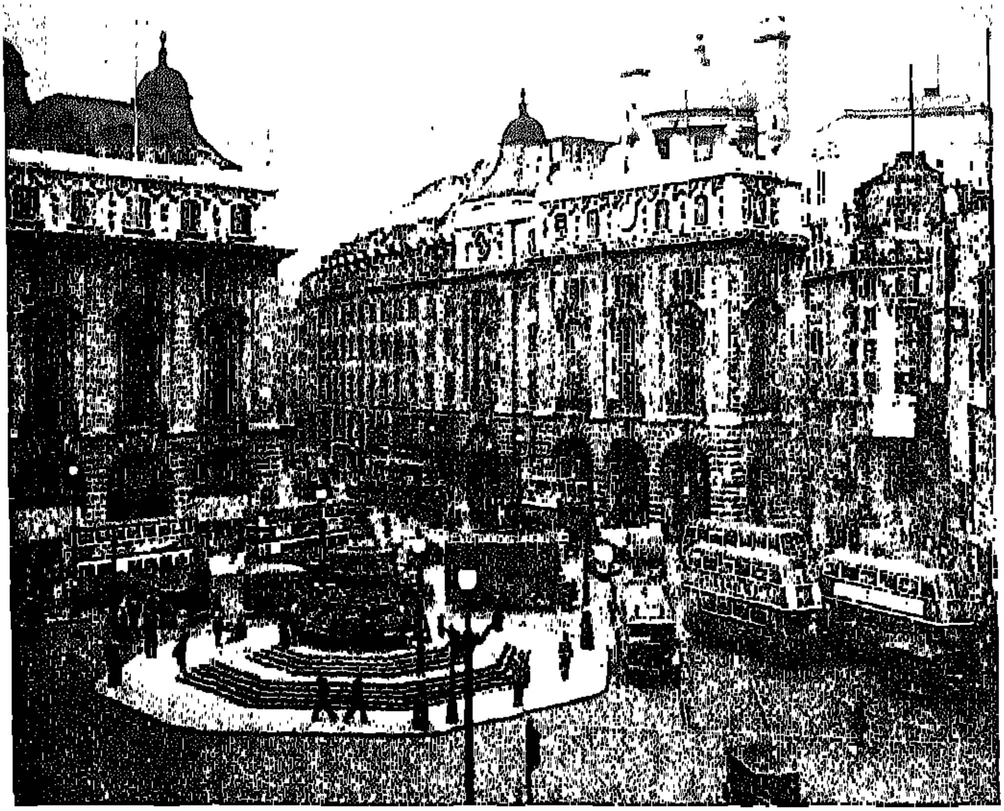


FIG. 97
Piccadilly Circus

GENERAL KNOWLEDGE THROUGH PICTURES

"Pictorial illustration is so necessary in the case of young children to ensure any clear mental conception of many of the terms which they will meet in the course of their lessons or reading, that equipment for the purpose should be regarded as essential in the Primary Schools. This equipment should include not only a supply of pictures for use in demonstration to a whole class, but a liberal supply of smaller pictures for group or individual use"—REPORT ON THE PRIMARY SCHOOL, 1931.

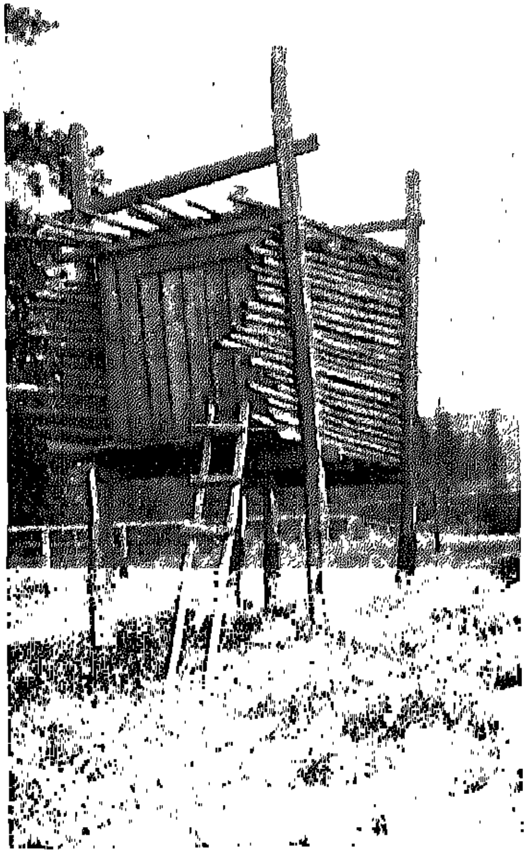
CURIOSITY, properly trained, is one of our most valuable means of educating both others and ourselves. It is the fact that it may establish a habit of self-education that makes it most valuable to the teacher, who can do no greater work than "lead out" the mind of the pupil so that it goes searching for knowledge throughout life.

By *knowledge* we do not mean an accumulation of facts, but rather that ability to apply and to use facts on which wisdom is built.

It is obvious that but for her curiosity Alice would never have gone down the rabbit-hole to Wonderland nor through the looking-glass, nor would "Lewis Carroll" have given us these stories if his young friends had not asked for them.

In teaching geography our aim to-day is to enlarge the child's conception of the world, and to show the inter-dependence of various parts of the world. In the course of home geography in this volume the child is shown how to relate his everyday experiences to a study of the "physical" attributes of the earth. In the course of world geography, including Great Britain, the various regions and their products are related up to the homeland. The following pages outline a method for use with the above work in geography and other subjects, the aim being to add to the reality of the lesson, and to ensure that the child *thinks* about the work and does not merely absorb passively the information given by the teacher.

Once the child's interest in geography is aroused (and at the Junior stage it should be easy to relate it to the spirit of adventure) he will find plenty of world-wide geography in daily life. Young children read books primarily for the story, but when they come into the Junior School they should be taught to read and re-read, giving a closer attention to the setting of the story once the plot is known. Even the ever-popular school story has a certain

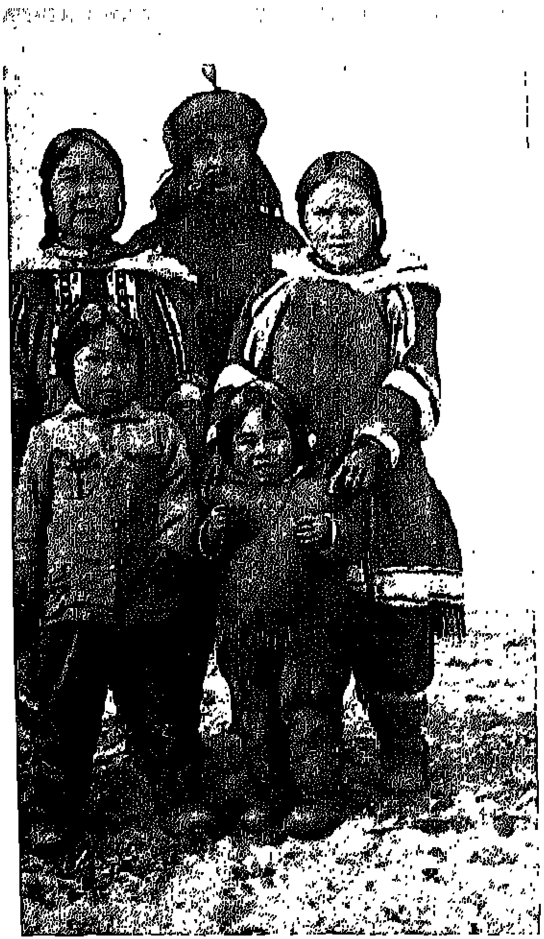


By courtesy of *Hudson's Bay Co*

FIG. 1

A Red Indian Meat and Fish Cache

amount of description of scenery and setting, but the young reader must be *taught* to build this into the knowledge of geography. Modern methods of publicity have made our hoardings instructive picture books, but again the child must be *taught* to apply the knowledge which may be picked up so effortlessly. Again, the Grocers' Association, in London at least, provides for its members lectures on the world-wide sources of supply, and a well-instructed grocer is always pleased to have an interested listener; if the teacher receives facts so garnered in an interested spirit, and inquires what else has been learnt by members of the class in such conversations, she is not only training the children to be on the look-out for knowledge, but is also encouraging them to acquire an easy and pleasant manner of address, which is largely a matter of practice.



By courtesy of Hudson's Bay Co.

FIG. 2

Eskimo "Family Group"

Note signs of contact with civilization, buttons on child's tunic, and father's pipe

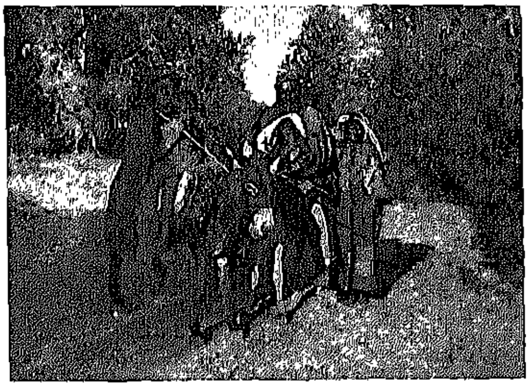


FIG. 3

A Happy Group of Baluchi Shepherds: Baluchistan

In order to learn from pictures (both illustrations and cinema films) the child must turn to them with eager curiosity and a desire to learn from them as much as possible. Mere idle curiosity will not seize on half the interesting things which may be seen or deduced. In this section a varied collection of pictures is shown, each two pages of pictures being preceded by a list of suggested constructive questions and followed by outlines of the answers. In some of these answers little matters are mentioned which the child could not be expected to know, and the teacher might, therefore, introduce these facts into a lesson preceding the viewing of the pictures.

It is suggested that the teacher should allow the children to go in small groups to a desk or table and look carefully at the pictures, while the rest of the class are engaged in reading or written work. Each group, on returning to their

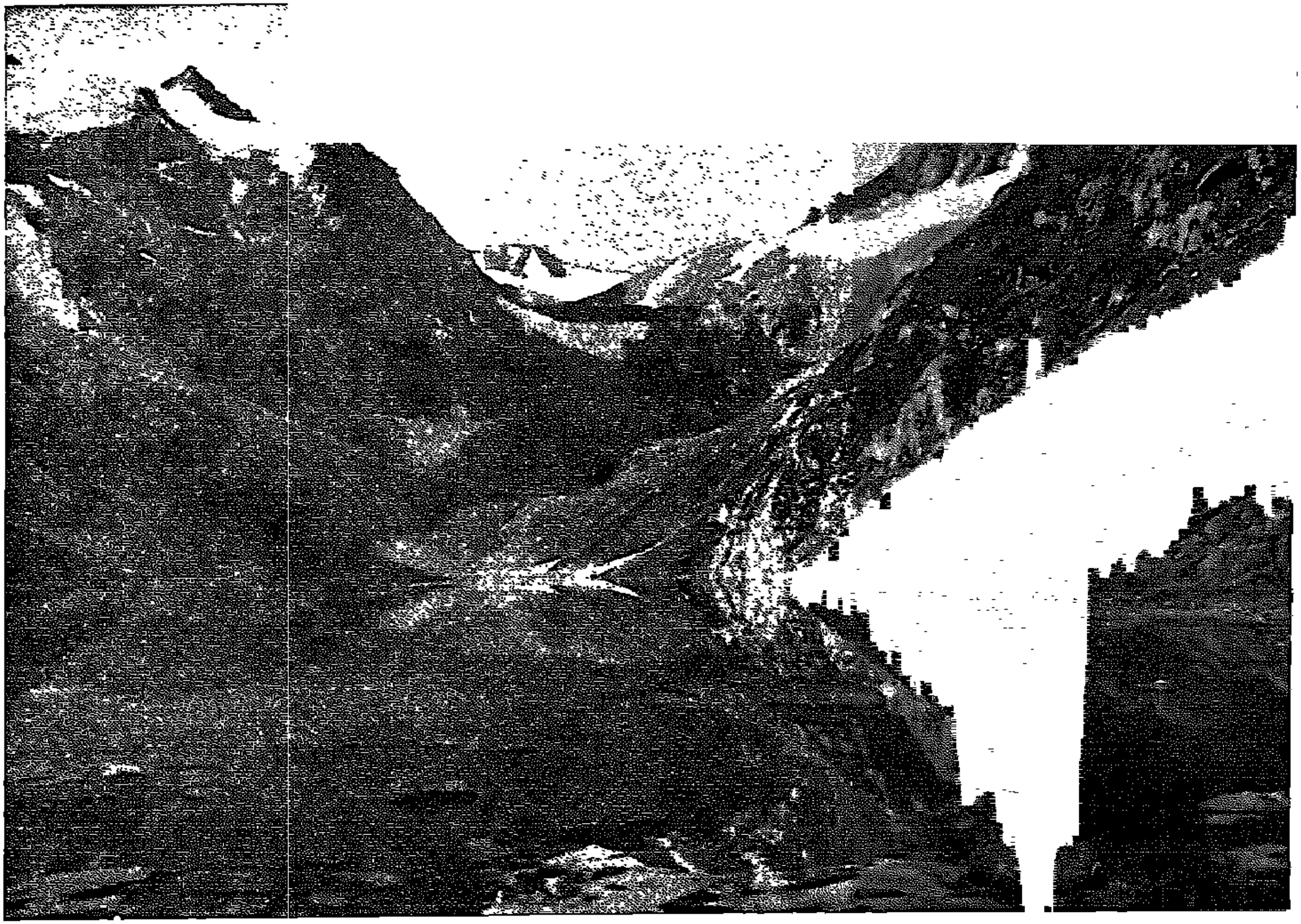


FIG. 4

Siddar Valley, Kashmir

(Our word "cashmere" is derived from name of material made from the silky hair of the Kashmir goat!)

seats, then answer the questions assigned to them by the teacher. It is best to alternate the practice of informing the children beforehand of the questions they will be expected to answer with "surprise" questions which will test their ability of really looking into a picture without guidance.

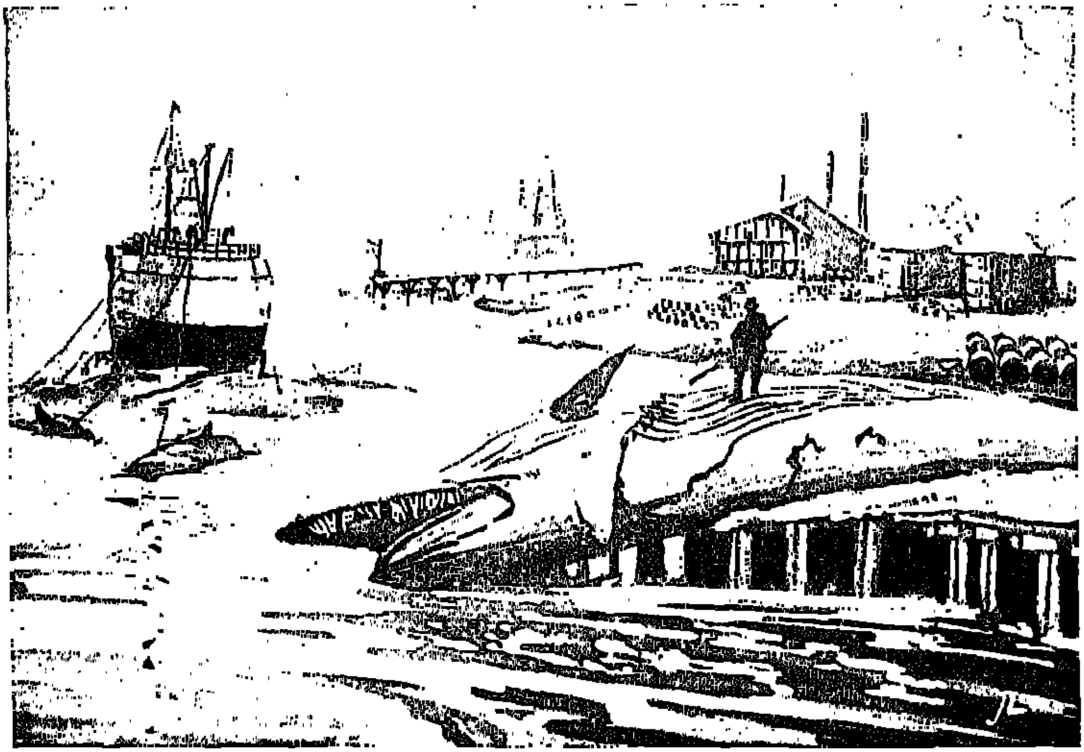


FIG. 5
A Whale Caught in the Antarctic
(Note size compared with man)

Obtaining a Good Supply of Pictures for the School

The following list of sources of supply may be of use to teachers in their quest for good pictures and lantern slides—

Publicity Department, India House, Strand (booklets and some posters)—on India.

Advertising Department, Messrs. Kodak, Ltd., Kodak House, Kingsway, London — lantern slides.

Publicity Department, Australia House, Strand—interesting booklets, well illustrated, and lantern slides.

Publication Department, Messrs. Cadbury Bros., Bournville, Birmingham—interesting and well illustrated booklets.

Publicity Department, Underground Railway, 55 Broadway, Westminster, London, S.W.1—a certain number of posters for sale: full list can be obtained from this address.

If any reader is anxious to obtain pamphlets or posters dealing with some particular country, the Associate Editor of the THE PRACTICAL JUNIOR TEACHER would be pleased to give further suggestions so far as possible.

Questions and Answers dealing with P.J.T. Charts "Rice in India" and "Wool in Australia" are included in the following pages.

JUNIORS OF FOUR CONTINENTS

SPECIMEN QUESTIONS

1. Name the four continents to which these children belong.

2. Which group of children are wearing the clothes which allow most freedom for play?

3. Which of these children have the longest childhood (i.e. the time before they work for their livings)?

4. How long has the answer to Question 3 been a fact?

5. How are Eskimo and British children alike in the treatment of their dogs?

6. What are the chief ways in which grown-up British and Eskimos use their dogs?

7. Four of these five groups are wearing the native clothes of their countries. Which group is not, and how does this come about?

8. What do you notice about the country in the background in Fig. 8?

9. The word *quilt* comes from a Latin word meaning *cushion*. In which of these pictures can you see some quilting? What can you tell from this?

10. What two things in the Eskimo picture are often to be seen in English back-gardens?

11. Why are the children wearing plenty of clothes in the picture of India?

12. Why do the children of Egypt have the head and the body well covered?

13. Which of these children would be most likely to play team games, in which the players have to work together, and not aim only at individual success?

14. Which of these children would wear woollen clothes? Why?

15. Which of these children would wear cotton clothes? Why?

16. Can you think of anything else produced in their native country which any of these groups might wear at any time?

17. What does the house in the Chinese picture seem to be made of?

18. What is the summer home of the Eskimos made of?

19. Write down the colour of the skin of each of these groups.

20. Most British children play at "being Red Indians," and go hunting, have a feast, and tell stories of great warriors of the past. Which of these children, when playing at being their own fathers, would do very similar things?

21. What is one thing which all the children on page 515 would probably have to do to "help mother"?

22. Why do most British children not have to do this?

23. Which of these children have seen a man selling water?

24. What is shown in Fig. 7 that provides food for the Eskimos?

25. Which of these children never attend school?

26. Which of them would be most unlikely to have enjoyed a swing?

27. Which of them would be most unlikely to have seen a book or a newspaper printed in their native language?

28. How many of these groups of children would be familiar with a horse and cart?

29. Write down beside the name of each group of children which of the following foods they probably had at dinner time—meat, fish, bread, tea, rice, dates, potatoes, spices, eggs.

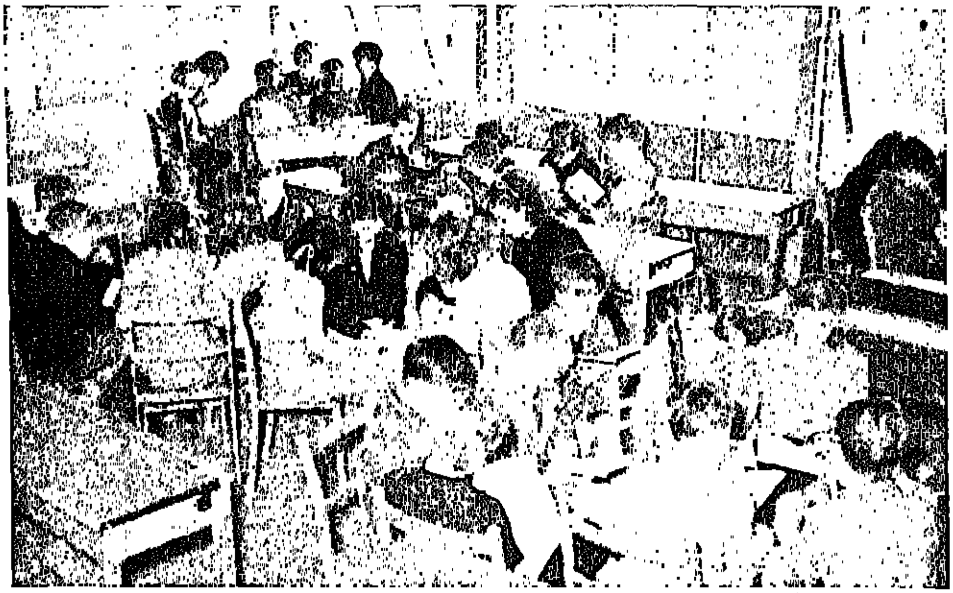
30. Describe the hats worn by the fathers of the children of each group.

31. What two garments worn at night by British children do the clothes of the Egyptian and Chinese children remind you of? What makes each of these garments suitable for both these purposes?

32. Which group of children is least likely to have seen snow? Which group has seen most snow?

33. Which of these children have (during part of the year) the strangest bedtime?

34. How many of these children would need to be warmly tucked up at night?



By courtesy of The London County Council

FIG. 6

Reading. Each Group is a distinct Unit

By courtesy of The Hudson's Bay Co.

FIG. 7

Eskimo Children by their Summer Encampment

FIG. 8

Indian Children in the Simla Hills

Kodak Snapshot

FIG. 9

Native Egyptian Children

By courtesy of *British and Foreign Bible Society*

FIG. 10

An Interested Crowd of Chinese Children

JUNIORS OF FOUR CONTINENTS

OUTLINE ANSWERS

1. Europe, America, Asia, and Africa.

2. The British children.

3. The British.

4. Less than a hundred years (since 1870, when the first Education Act was passed).

5. They both treat them as playmates.

6. The British use them as watch-dogs mainly; Eskimos use them to draw the sleigh in winter.

7. The Eskimos. They have bought various European garments at the trading station where their parents have sold the furs of the animals they had trapped and hunted in the winter. Their fur clothes of the winter do not allow of much variety, and their country does not provide them with means of making cloth garments.

8. The background shows the slopes of a hill terraced for cultivation, probably of tea. (Compare with France and Italy.)

9. In the Chinese picture. This shows that it is the colder season.

10. The clothes-line and prop.

11. Because Simla is in the hills of northern India, where the climate is fairly temperate.

12. To keep out the heat of the sun, because theirs is a country where there is not a great deal of shade from trees.

13. The British children.

14. British children, because they live in a temperate climate, and the sheep, a native animal, has supplied the people of this country with wool for hundreds of years.

The Eskimo children also would be likely to buy woollen clothes at the trading station, because they have no means themselves of making similar warm but soft garments.

15. The Egyptian, Indian, and Chinese, because cotton grows in their native countries; it has been made into cloth for hundreds of years in all these countries.

16. Eskimos: leather (reindeer), furs. British children: leather, artificial silk. Indian children: silk. Chinese: silk.

17. Mud.

18. A wooden framework covered with blankets and skins, with a metal pipe for chimney.

19. Eskimo: brownish yellow. British: white. Indian: light brown. Egyptian: darker brown. Chinese: yellow.

20. The Eskimos, but they would use toy spears and knives instead of bows and arrows.

21. Fetch water from the well.

22. Because we have water brought through pipes to taps in most British houses.

23. The Egyptian.

24. The lake (water and fish).

25. Eskimos—they lead a wandering life.

26. The Eskimo and Egyptian because of scarcity of timber.

27. The Eskimos. Very few books have ever been printed in their language.

28. The British and Egyptian.

29. British: meat, bread, potatoes, perhaps tea. Eskimo: fish, meat. Indian: rice, spices. Egyptian: bread, rice, dates. Chinese: fish, rice, eggs, tea.

30. Eskimo: probably a European hat or cloth cap bought at the trading station worn during the summer, but during the winter he would wear a fur hood. British: soft felt or hard felt (bowler) hat, cloth cap. Indian: turban. Egyptian: a round, brimless "fez" or a turban. Chinese: small round hat as seen in the picture, or European type of hat (the Chinese are now beginning to wear European clothes).

31. Egyptian dress: British nightdress. Chinese: British dressing-gown. The former is cool and allows plenty of freedom. The quilted gown is loose but warm.

(*Note.* Tight-fitting garments are not good for either cold or hot climate. The blood, as any "hot-water" system, must circulate freely to keep at the right temperature, and the pores of the skin must be able to get rid of waste matter if the body is to be healthy.)

32. Egyptians. Eskimos.

33. Eskimos, at time when sun does not set.

34. All of them during part of the year at least: cold nights may be experienced even in tropical countries.

BRITAIN

"Full of tumultuous life and great repose"

SPECIMEN QUESTIONS

Sorting and Cleaning Herrings in Scotland

1. How are herrings sorted out?

2. What are they packed in after being sorted and cleaned?

3. Was this photograph taken at a large port or a small village? Give a reason for your answer.

4. What words are represented by the letters L.M.S. on the railway truck in the background?

5. Why did it become the custom for women to do this work and men to go out with the fishing boats?

6. Was this photograph taken inland or by the sea?

7. Under what names can you buy herrings?

8 Why are herrings one of the cheaper fish?

9. Are the women in this picture preparing the fish for food for themselves and their families? Give reasons for your answer.

10. What do these women clean out of the fish?

11. What other item of food is similarly treated before we see it in shops?

12. Herrings are very nourishing: why do many people find them inconvenient to eat?

13. The spawn or roe of the herring is made up of thousands of eggs. Can you think of a reason for these large numbers?

A Market Gardener at Work

14. Is the market gardener digging up the potatoes for his own family?

15. In what way is his work like that of the fishwives in the picture above?

16. What will the potatoes be packed in for transport?

17. Who will buy the potatoes from the market gardener if he sends them to a large town?

18. Who else will buy them after this?

19 How are potatoes cooked?

20. How should potatoes be cooked to yield the greatest amount of nourishment?

21. What is it important to remember when boiling potatoes?

22. With what does the market gardener supply townspeople besides potatoes?

23. What part of the plant is a potato?

The Old Roman Wall, Chester

24. Who built this wall?

25. Why was it built?

26. What else did the builders of this wall make in England (these also have lasted to the present day). What was the purpose in this latter case?

27. Where is Chester? What word does its name come from? What other English names of towns contain this word?

Stone Cottages, Boscastle, Cornwall

28. In what English county was this photograph taken?

29. What name do we give to a piece of land so jutting out that it is almost surrounded by the sea?

30. When are water, gas, and electric light laid on to such cottages from the main?

31. How do cottagers get water if it is not laid on to taps in the cottage?

32. In what local industries might men who live in Cornwall be employed?

33. At which season of the year was this photograph taken?

34. Why are the roofs of the cottages made to slope and the tiles to overlap each other?

35. Why are thatched roofs still seen occasionally in the country?

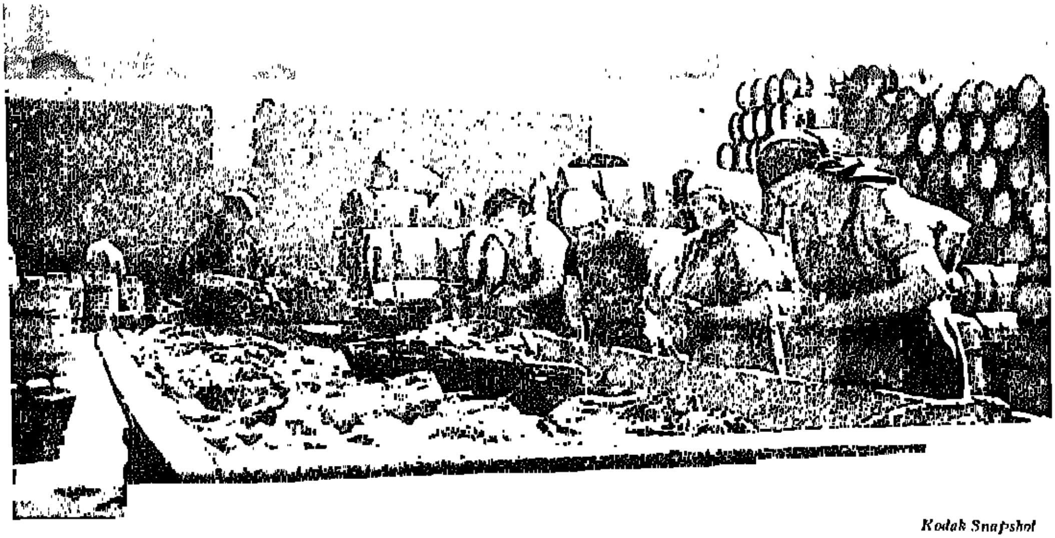
The Sussex Downs

36. Why is sheep farming the chief industry of the Downs?

37. For what does the Sussex farmer keep sheep?

38. Why is the carcass of the sheep called *mutton.*

39 What animal is walking at the shepherd's heels? For what does his master value him chiefly?



Kodak Snapshot

FIG. 11

Sorting and Cleaning Herrings in Scotland

By courtesy of Messrs. Suttons, Reading

FIG. 12

A Market Gardener at Work

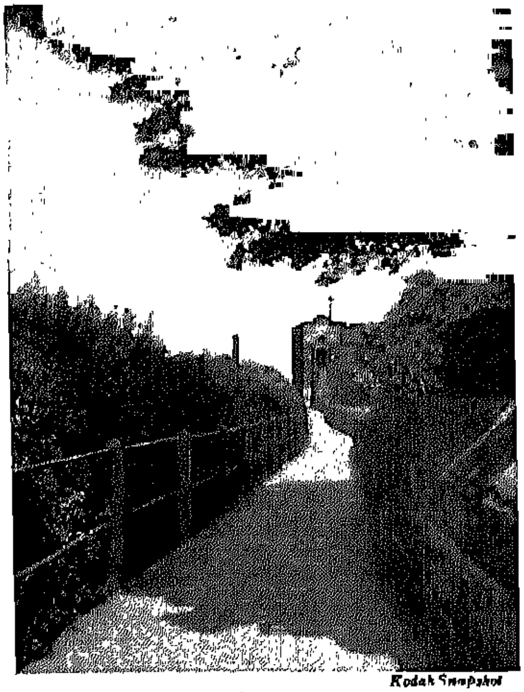


FIG. 13
The Roman Wall, Chester

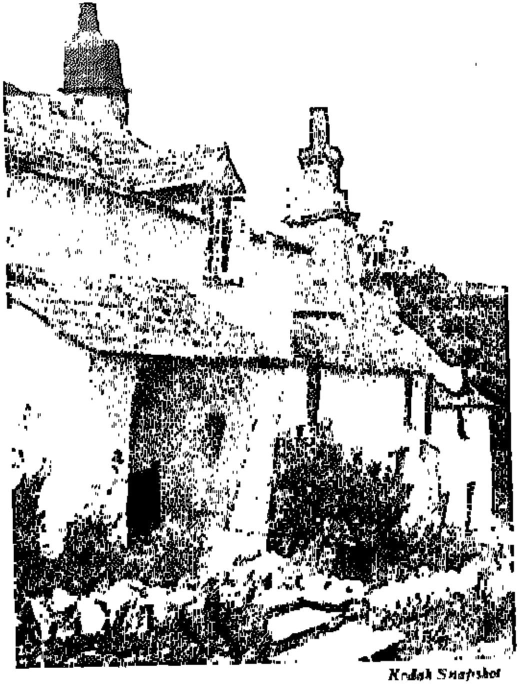


FIG. 14
Stone Cottages, Boscastle, Cornwall

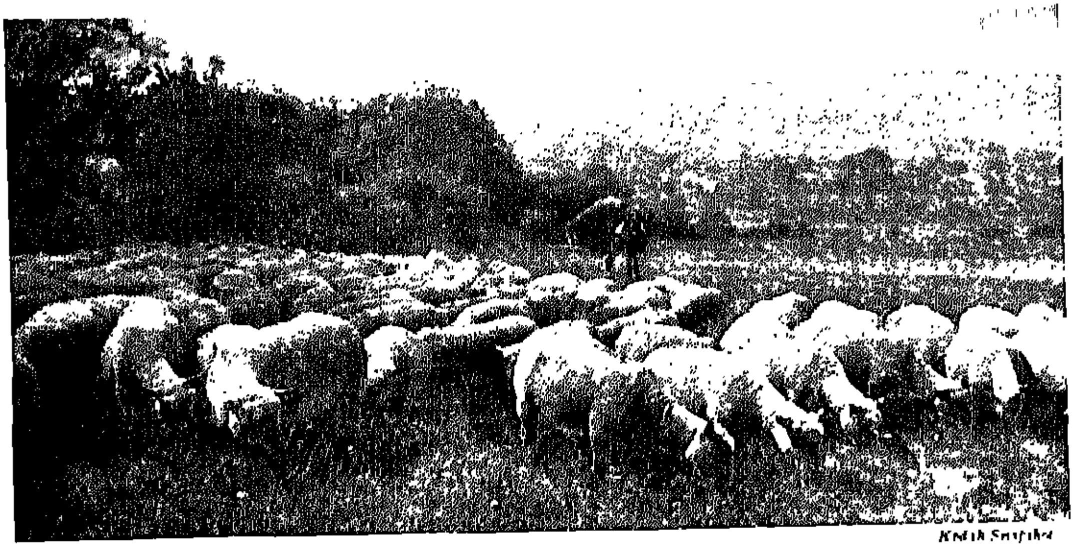


FIG. 15
The Sussex Downs

BRITAIN

OUTLINE ANSWERS

Sorting and Cleaning Herring in Scotland

1. They are graded into various sizes, the larger ones being sold for the higher price.

2. The barrels.

3. A large port; the pile of barrels indicates that the industry here is of considerable size, and the railway trucks would not run down to the centre of a small village industry.

4. London, Midland and Scottish (Railway).

5. Mainly because the fishing fleet might be away some days, and women were more necessary for care of the home and the children.

6. By the sea, because the herring is a salt-water fish.

7. Fresh herring, kipper, bloater.

8. Because they are caught in very great numbers as the shoals move down the coastline.

9. No, but to be sent to town markets. The barrels are evidently for the packing of the fish, and this work would not be done beside the railway if the train were not going to take the fish away.

10. The stomach organs; the stomach may be likened to a factory, which prepares food for human consumption, but is not itself good to eat.

11. Meat.

12. Because of the numbers of small bones.

13. Because many fish in the sea live on the young of other fish; therefore large numbers are produced to allow for this.

A Market Gardener at Work

14. No: he is preparing them for market.

15. In both cases the worker is preparing the product of his or her surroundings for sale, in order to earn money with which to buy goods produced by the labour of other people from many parts of the world.

16. In sacks.

17. The wholesale dealer who has a stall in the central market—the "middleman."

18. First the greengrocer, then the housewife who wants them for her family's dinner.

19. Boiled, baked, steamed, or fried.

20. In their jackets, because after the boiling the outermost skin can be removed without damage to the outer layer of potato, in which there are valuable food elements.

21. To keep the lid on the saucepan—this applies to all vegetables grown under the soil.

22. Beans, peas, cabbages, lettuces, strawberries, raspberries, red and black currants, etc.

23. A swelling on an underground stem (the "eyes" are really buds).

The Old Roman Wall, Chester

24. The Romans.

25. As a means of defence.

26. Roads, so that they could move their armies quickly and easily; the natives of Britain rebelled constantly.

27. On the river Dee in the county of Cheshire, in the north-west part of England. The name comes from Latin *castra*, an encampment. E.g. Doncaster, Lancaster, Manchester, Winchester.

Stone Cottages, Cornwall

28. In Cornwall: south-west of England.

29. A peninsula.

30. When there are a considerable number of them together, so that the revenue from sale of gas or electricity used will pay back within a reasonable time the cost of the pipes or wires.

31. From pumps, wells, and springs.

32. Mining, fishing, and farming.

33. Summer; the trees are in leaf and the flowers in bloom; the windows are wide open.

34. So that rain will drain off the roof. If the tiles were fitted edge to edge the rain would sink in between them.

35. Because the countryman, in his quieter life, welcomes change less than the townsman does. Also the danger of fire in towns is much greater than in the country.

The Sussex Downs

36. The fine grass of the chalky Downs keeps sheep healthy but is not suitable for cattle.

37. Both for their wool and for slaughter.

38. Because in the days of the Norman Conquest the conquerors spoke their native French, and when dishes were served called them by the French names: French for sheep, *mouton*. Saxon peasants preserved their own word *sheep*.

39. A dog. His help in keeping flocks and herds from straying is one of his oldest links with man.

INDUSTRY IN FIELD, TOWN, AND FOREST

QUESTIONS

1. Name two big differences between hay production and cocoa production.

2. In how many of these pictures are trees to be seen?

3. What is the machine doing to the hay?

4. How is it driven?

5. With what does the farmer's hay help to supply the people of Bournville?

6. What do the Bournville workers supply to the farmer?

7. Does the picture of Bournville make you feel that the town grew up by accident or that it was thought out? What is the adjective used for a town which has been well schemed out?

8. What do we call a town which has a large number of open spaces allowed for in the plan to which it is built?

9. Why is it better for one's health to live in this sort of city, or in the country, than in a crowded manufacturing town?

10. Where is Trinidad? Why is it called *an island*?

11. Why is America called the *New World*?

12. In 1526 Cortés brought back cocoa beans from Mexico and prepared cocoa in Europe; which European country do you therefore think was the first in which cocoa was tasted?

13. In what countries is cocoa grown to-day?

14. Which is the biggest producer of these?

15. *Harvest* comes from an Anglo-Saxon word. What does it mean? What does this tell us about the Anglo-Saxon tribes?

16. The cocoa harvester carries a long bamboo pole. What is fixed to the top of this?

17. The cocoa tree bears flowers and fruits all the year round, but there are two main harvests. What makes this possible?

18. What happens to the pods after the men have cut them from the trees?

19. Why is human labour better than machines for this harvesting?

20. What does each woman do with the pods when her basket is full?

21. The pods are cut open with a broad knife called a cutlass, and are then broken in two and passed to women sitting round the pile of pods. What do these women do to the halves of the pods?

22. The beans and pulp are taken in baskets to the *fermentary*. How are they taken there?

23. What is the effect of fermentation?

24. What next happens to the beans, and what colour does this make them?

25. Suggest means by which the beans are then taken to the nearest port.

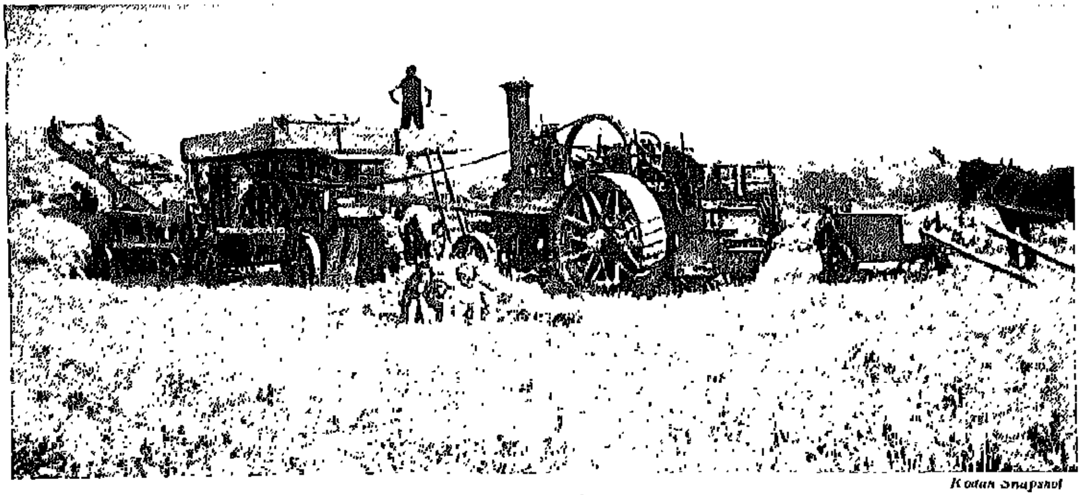
26. How are they brought to England?

27. Bournville is on the outskirts of Birmingham. Find out from a map how the cocoa must finally reach Bournville.

28. What processes are carried out with the beans for both cocoa and chocolate?

29. What special processes are then carried out for these separate purposes?

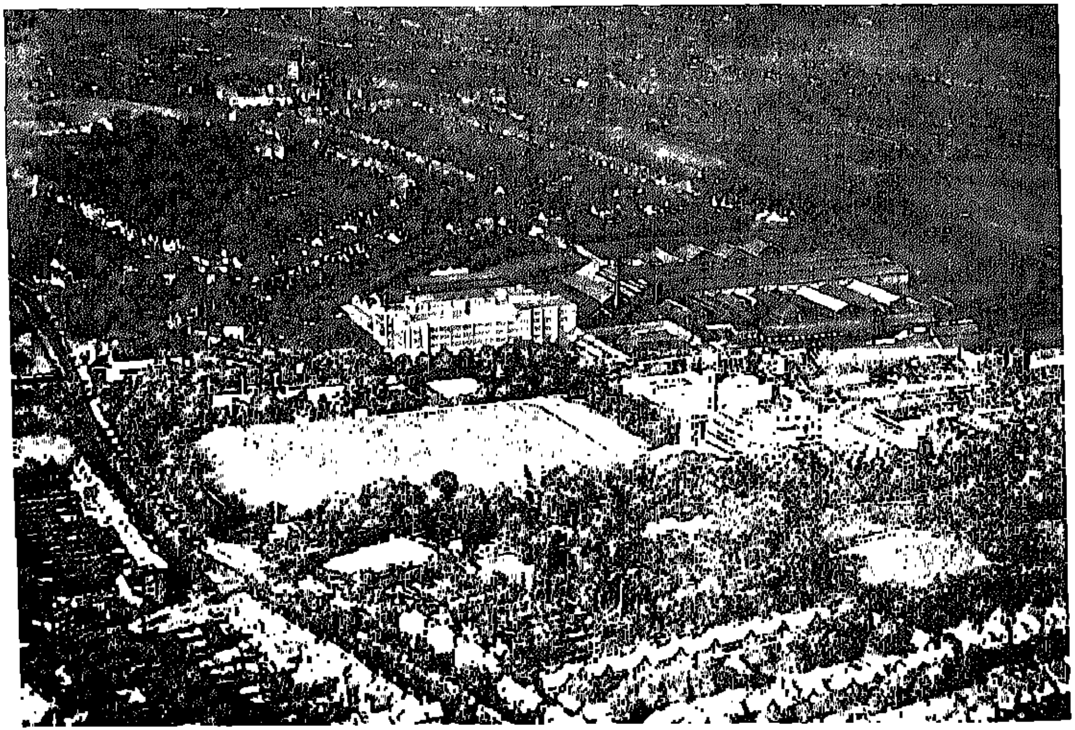
30. What industries are you helping each time you drink a cup of Bournville cocoa or eat a bar of chocolate?



Kodak Snapshot

FIG. 16

Modern Methods of Haymaking in Britain



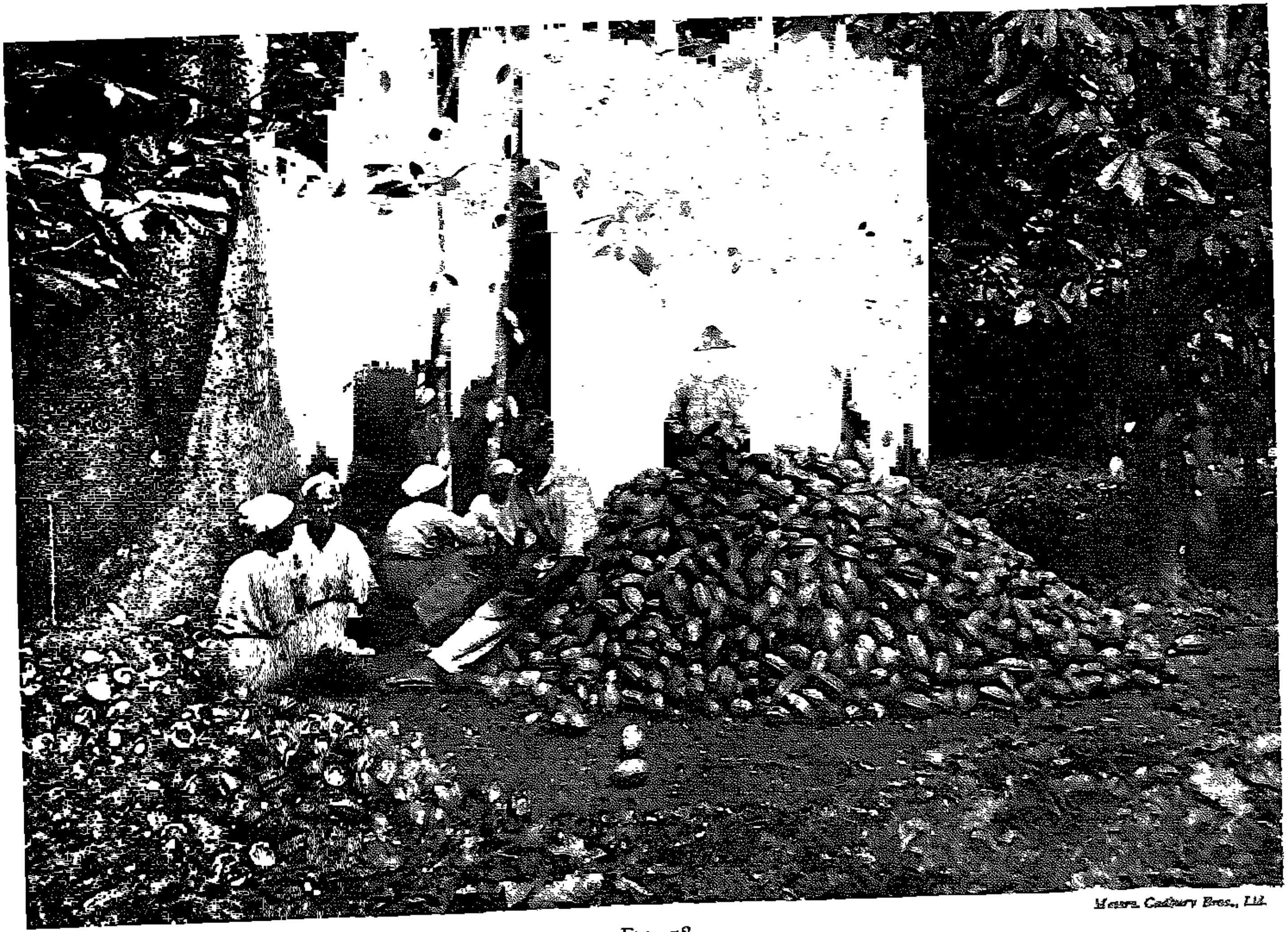
By courtesy of Messrs. Cadbury Bros., Ltd.

FIG. 17

England: Air View of Bournville Cocoa Works

By courtesy of Messrs Cadbury Brothers Ltd Bournville

HARVESTING COCOA, TRINIDAD



By courtesy of Messrs. Cadbury Bros., Ltd.

FIG. 18

Extracting the Beans from Cocoa Pods, Trinidad

INDUSTRY IN FIELD, TOWN, AND FOREST

OUTLINE ANSWERS

1. For example: hay produced on the farm for consumption on the farm, cocoa grown in one country for use in another; hay harvested by machinery, cocoa by human labour; hay can be produced in more varieties of climate than cocoa; hay is food for animals, cocoa for human beings; one hay harvest, two cocoa harvests each year.

2. In all four. [Cocoa (*cacao*) tree resembles apple tree.]

3. Tossing it, to let air in and complete drying.

4. By a belt from the steam engine.

5. Dairy products, beef, and mutton, in winter time.

6. Cocoa powder with which to make a nourishing drink, and chocolate.

7. Well thought out—*well-planned.*

8. A garden city.

9. Because the air is more free from dirt, and during the day vegetation adds oxygen to the air. Also in a crowded town the health-giving sunshine does not reach people freely.

10. Off the coast and to the north of South America; because it is surrounded by the sea.

11. Because when explorers first found it it was like a new world to them, for in sailing westward they thought to find themselves arriving on the east coast of Asia (note the *West Indies* and the name *Indians* given to the natives of North and South America).

12. Spain, the native country of Cortés.

13. Brazil, Ecuador, Venezuela, West Indies, Gold Coast, Nigeria, Uganda, Ceylon, and Java. (Find these on a map of the world.)

14. The Gold Coast of Africa.

15. Gathering of crops. The Anglo-Saxons, therefore, cultivated crops, and were an *agricultural* people.

16. A sharp knife. (Flowers grow from little cushions on the main branches and trunk of the *cacao* tree.)

17. As there is no "winter" time where the cocoa tree grows the tree does not shed its leaves, as it can get water from the earth all the year round, and can, therefore, let the leaves give off moisture all the year. Thus the productive activities of the tree go on all the year.

18. The pods fall to the ground and women come along with baskets and gather them up.

19. Because the ripe pods have to be distinguished by the picker, and the fallen pods are widely scattered. Machines are better for straightforward work on a large scale.

20. Takes them to a heap where men are opening them.

21. Scoop out, with a wooden spoon, the beans and the juicy pulp round them.

22. In baskets carried by mules.

23. The pulp breaks up into the elements of which it is composed, and the liquid is drained off. The beans are periodically turned over to let the air get to them, and the coating of dried pulp juice has been found to improve the bean. Where the beans are not fermented the pulp is washed off.

24. They are spread out on platforms in the sun to dry, which turns them dark brown.

25. Mule-, horse-, and ox-carts, canoes, motor lorries, railways.

26. On big ships.

27. By train.

28. Sieving; cleaning; sorting; roasting; "kibbling" (loosening of husk and breaking bean into pieces, or "nibs"); removal of husk by winnowing machines; grinding.

The grinding produces a liquid mass, because it causes melting of the oil in the beans (*cocoa butter*).

29. *To make Cocoa.* Some of the cocoa butter is extracted. The remaining firm cakes of cocoa are then ground to powder, which is cooled, ground again, and sieved, after which it is weighed out and put into paper bags ready to go into tins—all by machinery.

To make Chocolate. Sugar is added to the ground nibs, and the two are mixed and crushed together, then ground to a powder. Mixing and kneading machines turn this into a thick, smooth liquid, which is run off into moulds. Milk is added to the "nibs" in making milk chocolate.

30. The producing on the cocoa estates, the shipping industry, railways, saw-milling, case-making, tin and cardboard box making, printing, paper, engineering, coal mining, etc.

INDUSTRIES OF AUSTRALIA

Practical Junior Teacher Chart " WOOL IN AUSTRALIA " *and Pages 528 and 529*

SPECIMEN QUESTIONS

Chart: 1. *Mustering.*

1. What is a sheep farm called in Australia?

2. What is the farmer's house called?

3. Growing crops is called an *agricultural* industry: what is the corresponding word applied to keeping flocks and herds?

4. What sort of countryside does this picture show?

5. Why is it ideal for sheep farming?

6. What is mustering?

7. Why is the shepherd mounted on a horse?

8. What other animal helps him?

9. Why are the sheep being mustered?

Chart: 2. *Shearing.*

1. What labour does machinery save the man who is shearing in the right-hand picture?

2. The shearer has to hold down the sheep and work at a great pace without hurting the sheep or spoiling the fleece. What must be two of his qualifications?

3. What tool does the hairdresser use similar to that used for shearing by machinery?

4. What is the wool called when first cut off the sheep?

5. How are the sheep brought to the shearer?

6. Sheep are sometimes dipped before they are shorn, to cleanse their wool and skin. Why would this be done a good long time before shearing?

7. Why do shearers refuse to work during wet or damp weather?

Chart: 3. *Dipping the Sheep.*

1. What is the reason for dipping when it is done after shearing?

2. What insect would settle on cuts on the skin and cause poisoning?

3. The sheep in the photograph are standing on an escalator which takes them down to the water. What is an escalator?

4. Why is it necessary?

5. Why are escalators used in underground railway stations?

6. Can sheep swim?

7. Why would a sheep find it easier to swim after it had been shorn?

8. What is put into the water in which the sheep are dipped?

9. For what are the poles used, and why is it necessary so to use them?

10. Is the dipping carried out indoors or outdoors? Give a reason for your answer.

Chart: 4. *Classing the Wool.*

1. Do you think this takes place at the sheep station? Give a reason.

2. What does "classing" mean?

3. Why is this done in the shearing shed?

4. How do you think men learn to class wool?

Chart: 5. *Baling by Wool Press.*

1. Why is this machine called a wool press, and what is the need for it?

2. What is the man in this picture doing?

Chart: 6. *Transport of Wool to Rail-head*

1. Is the camel native to Australia?

2. Why is it useful as a beast of burden in Australia?

3. In what other continents is the camel used, and how is it used?

4. How many different kinds of camels are there?

5. The camel is often described by a romantic name which suggests its great usefulness. What is this name?

6. Why are oxen used as beasts of burden?

7. Of what use are their horns to them?

8. What other animals have horns?

9. Is the wild ox a fierce and dangerous animal?

10. How is man able to tame or "domesticate" fierce animals in the first place?

11. In what countries is the horse used as a beast of burden?

12. Why do motorists in large towns wish to have horse traffic abolished?

13. Is the horse a native animal of Australia?

14. In what countries are wild horses to be found to-day?

15. What are the names given to a young horse, a female horse, and a male horse?

16. What is a mule?

17. On what sort of water are barges used?

18. Why are they used?

19. In what countries are many barges seen?

20. What is the chief advantage of water transport to-day?

21. What additional advantage would water transport have for peoples living among fierce tribes in forest country?

Chart: 7. Transport to Warehouse by Train.

1. What advantages have railways as means of transport?

2. Why is not the wool carried in every case all the way from sheep station to warehouse by train?

3. What nation introduced railways into Australia?

4. What are the two most essential requirements for building railways?

5. Heat makes metals expand: what effect would this have on railway lines if they were made in one long piece and fixed securely in position?

6. How are they made to guard against this?

7. Why is the warehouse so close to the railway?

Chart: 8. Sale of Wool.

(a) Bales in Warehouse open for Inspection.

1. Why are the bales opened?

2. Who do you think is going to inspect the wool?

3. What is the difference between "looking at" something and "inspecting" it?

4. Does the wool in the bales look very much like a dainty woollen dress?

5. What do the marks on the bales show?

(b) The Auction Room.

6. Who is the man at the table on the left?

7. Who are the men in the seats facing him?

8. For what purpose are they in this room?

9. What have they done just before this?

10. To what country do they belong?

11. Why do they not go up to the stations to buy the wool?

12. Do they buy in large or in small quantities?

13. What will they do with the wool when they have bought it?

14. How does the sale go forward?

15. What other everyday necessities are sold by auction?

Chart: 9. Shipping the Wool.

1. How is the wool put aboard the ship?

2. Into which part of the ship is it put?

3. What is the name given to goods thus carried?

4. Do steamers carry passengers as well?

5. What is the use of the small boats which a large ship carries?

6. How is the wool taken to the wharf?

Industries of Australia (Figs. 19–22).

1. Are there many different ways of earning a living in Australia? Give a reason for your answer, and name some products of Australia which are exported to Britain.

2. What is the name of the Australian tree from which we get eucalyptus oil? From which part of the tree is this obtained?

3. Why has the teamster a horse tied to the back of the wagon in the picture of oxen crossing a stream?

4. Can a motor tractor cross a stream in this way?

5. What must be built before motor traffic and railways replace beasts of burden in this type of country?

6. Why is it that mechanical transport is now taking the place of animal transport?

7. The whip the teamster carries is called a

"stock-whip." Would it be long or short? Give a reason for your answer.

8. Look at the picture of the vineyard and then at the PRACTICAL JUNIOR TEACHER Chart showing Vegetation Regions of the World. What sort of climate has Western Australia?

9. What are products of the vineyards?

10. For what purpose are grapes in Fig. 21 going to be used? (Notice drying racks.)

11. Is all the wool produced in Australia exported to other countries?

12. Has this always been the case?

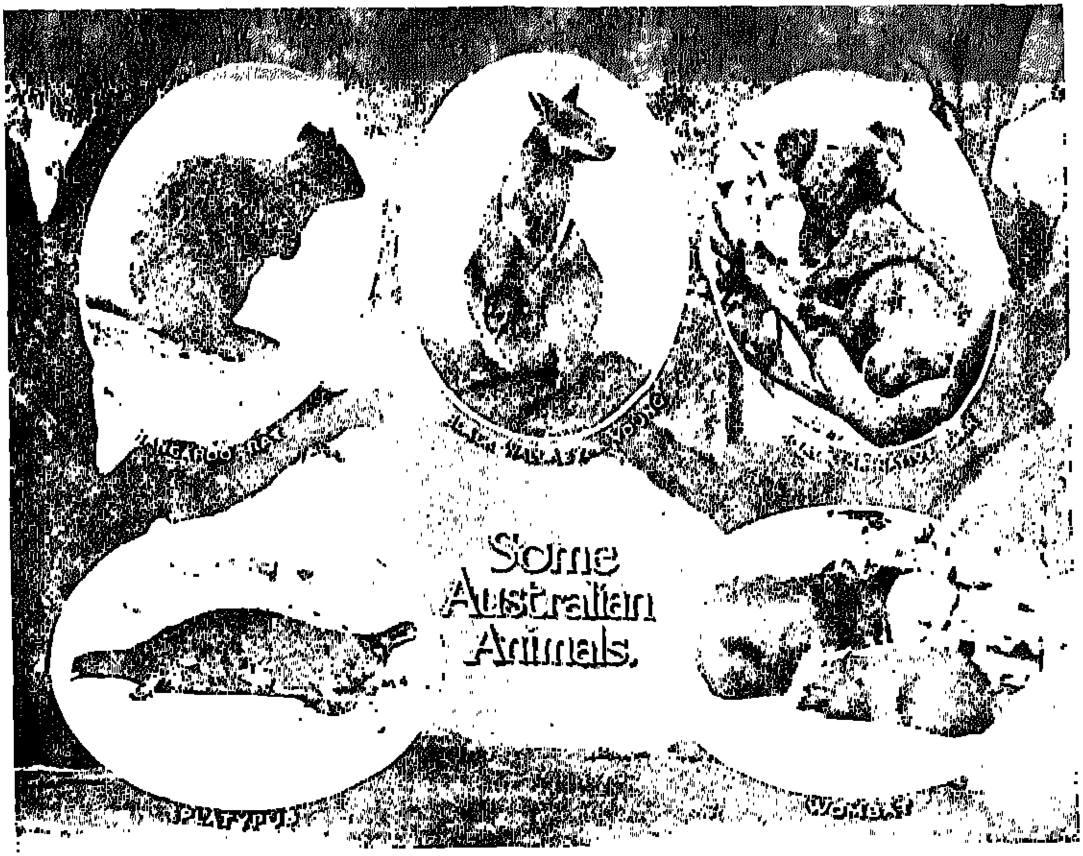
13. In the picture of the Wool Mill, has each machine a separate motor?

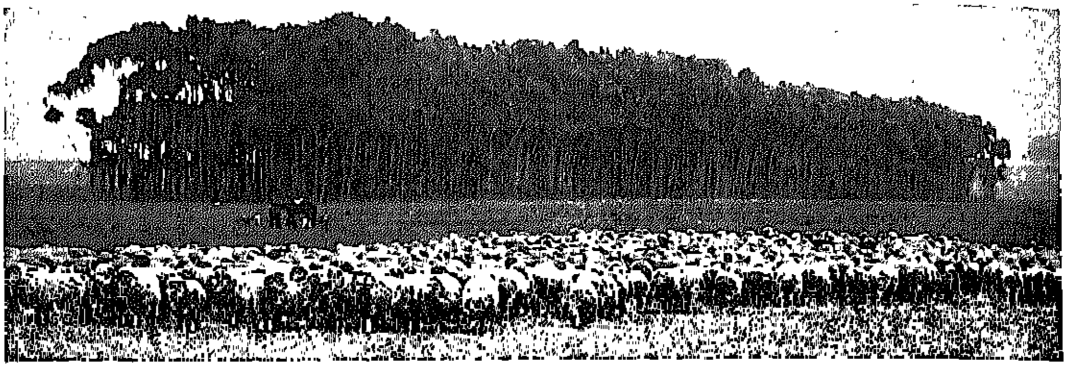
14. How is the mill lighted?

15. Name as many classes of Australian *workers as you can think of.*

Note. While it is advisable to introduce Juniors to the more picturesque side of life abroad, in order to arrest their attention, they should nevertheless be made to realize that large towns all over the world have many things in common. Australian magazines are particularly well illustrated, and show both town and country life. If none of the children in the class has one sent by friends or relatives it is well worth while to spend a shilling on one occasionally.

Many farmers now own airplanes, wireless, gramophones, etc. They are not out of touch with the world as were the early settlers.

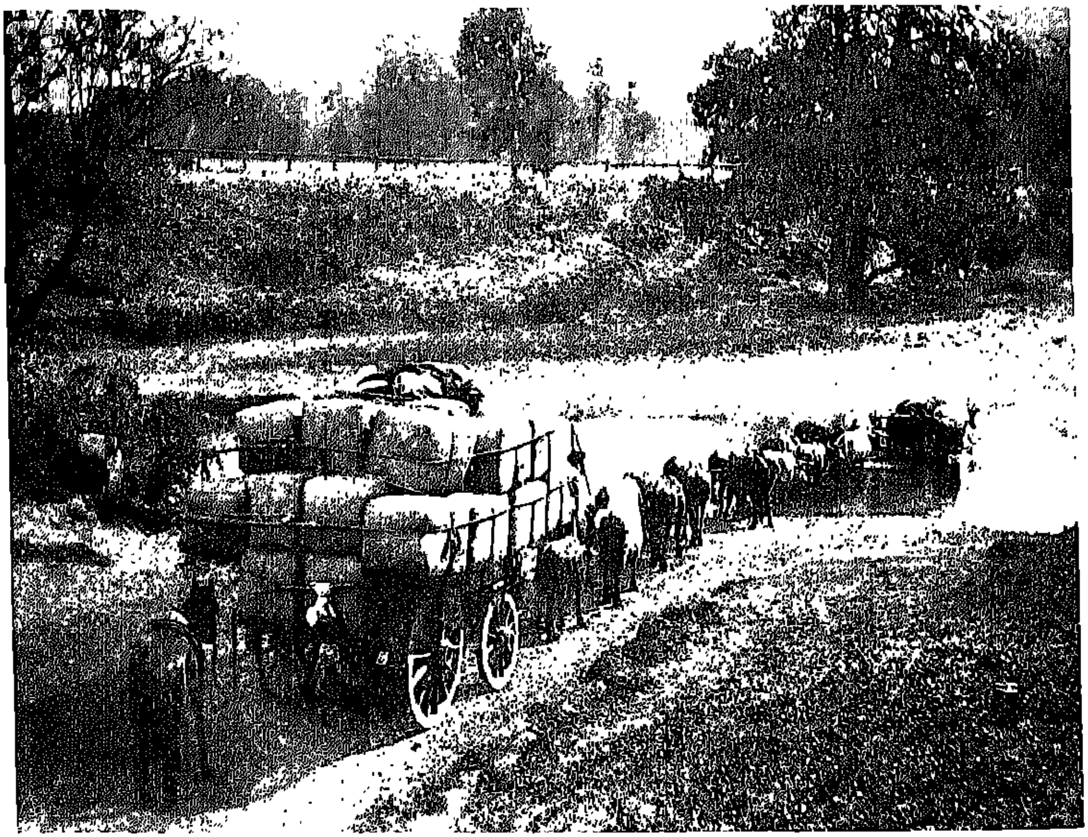




By courtesy of *The High Commissioner for Australia*

FIG. 19

A Sheep Station in Victoria



By courtesy of *The High Commissioner for Australia*

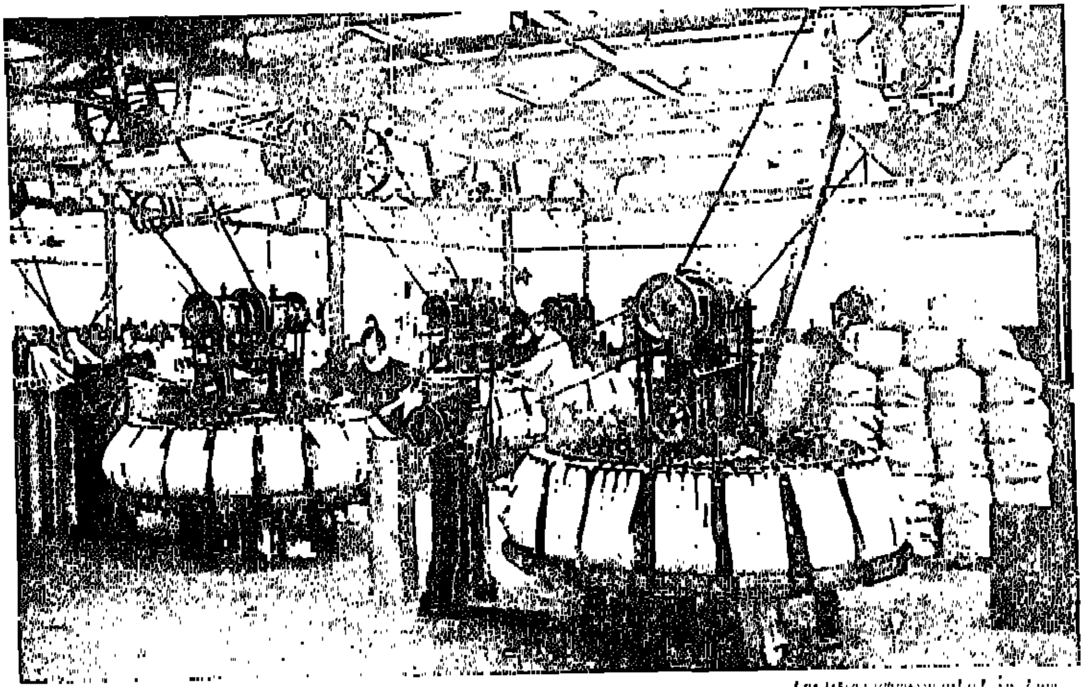
FIG. 20

Wool Team

By courtesy of *The High Commissioner for Australia*

FIG. 21

Vineyard and Drying Racks, Western Australia



By courtesy of *The High Commissioner for Australia*

FIG. 22

Wool Mill, Geelong, Victoria, Australia

INDUSTRIES OF AUSTRALIA

OUTLINE ANSWERS

Chart: 1. *Mustering.*

1. A sheep *station* or sheep run.

2. The homestead.

3. Pastoral.

4. Large extent of plains with mountains in background. Some timber.

5. Because it is grassland with river running through it. Owing to the warm climate the Australian farmer has not the expense and trouble of housing and hand-feeding sheep in winter.

6. Gathering together—*muster* comes from Latin *monstro*, to show: present meaning acquired from the fact that things or people are gathered together to be shown, as for review of troops.

7. Because the sheep are scattered over large areas of country.

8. A dog.

9. To be driven to the shearing shed.

Chart: 2. *Shearing.*

1. The constant opening and shutting of the blades with which he shears.

2. Strength and skill.

3. Clippers, used for short hair at back of neck.

4. A fleece.

5. They are pushed through the doors of the pens on left of pictures, as the shearers are ready for them.

6. Because if the wool were damp it would cling to the shearing tool.

7. They claim that it would cause them to suffer from rheumatism; also, even if there is not a great deal of rain, the moisture in the air gets into the wool and makes it difficult to cut.

Chart: 3. *Dipping the Sheep.*

1. To cleanse the skin of the sheep.

2. The blowfly.

3. A moving staircase.

4. Because sheep are not fond of entering water.

5. To save the energy of the traveller.

6. Yes, practically all animals will swim if they are in danger of drowning, but the sheep does not enjoy water.

7. Because its heavy fleece would get soaked with water and become a tremendous weight (remember how heavy your own hair feels when it is thoroughly wet).

8. Disinfectant ("sheep dip").

9. To push the sheep's body well under the water, which is not very deep.

10. Outdoors: trees can be seen, and the gate is not high enough to shut off the view of them as it or the adjoining wall would do if this scene were inside a building.

Chart: 4. *Classing the Wool.*

1. Yes. Its number on the chart indicates that it comes before the transport to the railway.

2. Sorting out and putting all of the same kind together, according to quality, therefore according to its value.

3. To save time and labour carrying to and fro. As soon as the fleece is cut off the sheep's back a man (whose special job it is to do this) carries it to the table where it is classed.

4. At present generally by working with and watching an experienced man, as the boy in this picture. Government classes are conducted now, where students in towns learn how to do this, but these are a recent development: the classes are attended by young women as well as by men.

Chart: 5. *Baling by Wool Press.*

1. Because it presses the wool down, in order to make it take up as little room as possible. The great pressure drives out the air from between the strands of wool, and this saves space, which means economy in transport.

2. Stitching up the bag, which he considers to have been filled and compressed as much as possible.

Chart: 6. *Transport of Wool to Rail-head.*

1. No. It was introduced at the end of the nineteenth century because of the desert land with its lack of water and roads (Northern and Western Queensland, South and Western Australia, and the Northern Territory).

2. Because it can live on very poor country, and can go for a week without a drink, owing to the storage of food in the hump and of water in the stomach. Also it is strong and can carry 3 cwt. of wool, strapped to the hump, a distance of 20–25 miles a day for days on end. A team of about 20 camels will draw 5 tons of wool 20 miles a day over dry or desert country.

3. Asia and Africa, as a beast of burden and as a mount in the tracts of desert. Its flesh and milk are used as food and its hair is woven into cloth.

4. *Three chief kinds: The Arabian camel* has one hump and is used as a beast of burden; the dromedary is a type of one-humped camel which is particularly fast and so is used for riding, not for carrying goods; the Bactrian camel of Central Asia is shorter and broader and has two humps. The llama of South America is closely allied to the camel but has no hump.

5. The ship of the desert.

6. Because they are exceedingly strong.

7. As a weapon.

8. Most of the herb-eating animals—gnu (horned horse), deer, bison, giraffe, rhinoceros, boar, etc. The only animals which have horns are the hoofed mammals. The flesh-eating animals have teeth and claws to tear their food with, and these serve as weapons.

9. Yes.

10. By catching the young animals and training them to live with him.

11. In temperate countries, particularly England. Canada, Australia. Mountainous, very cold, and very hot countries all have animals which are more suited to their conditions, e.g. the donkey, reindeer, oxen and camel.

12. Because a horse drawing a heavily laden cart cannot move quickly and, therefore, holds up traffic coming along behind it if there is not room in the road to go round it: in streets crowded with traffic travelling in two directions it is often difficult to " pull out."

13. No. Horses were taken to Australia by British settlers, as were the ox and camel, because Australia has no native animal which can be used as a beast of burden.

14. In the steppe-lands of Russia, in South America, and in Australia. It is thought, however, that in each case they are descended from domesticated animals which escaped and reverted to the habits of their ancestors of long ago. The origin of the horse is not definitely known.

15. Colt; mare; stallion.

16. A cross between ass and mare.

17. On rivers and canals—easily navigable water.

18. Because, being flat-bottomed, they hold a great deal of cargo and can go into shallow water. A small steam tug can pull a number of barges through shallow water, whereas a laden steamship would need deep water to carry it.

19. In the Netherlands and France, where there are many canals.

20. Its cheapness.

21. In carrying goods on water they could not be suddenly surrounded by enemies as they could on the land.

Chart: 7. Transport to Warehouse by Railway.

1. They are speedy and goods do not run much risk in transport, as trains run smoothly because they run on lines.

2. Because it would cost too much to run railways out to every sheep station: transport of wool and other products of one farm would not make it worth while.

3. The British.

4. Iron and the steel which is made from it by addition of carbon.

5. They would buckle and wheels could not run on them.

6. The lines are laid in sections on wooden supports (sleepers), with a space between each two sections.

7. To save unnecessary transport. If the bales had to be taken off the train and put on to another conveyance the labour would cost a great deal.

Chart: 9. Sale of Wool.

(a) *Bales in Warehouse Open for Inspection.*

1. So that the men who are going to buy the wool can walk round and examine it, and make notes in their catalogues of those for which they will bid.

2. Wool buyers.

3. "Inspecting" is a very careful looking at or into something in order to find out certain things about it.

4. No; it is thickly matted with grease and dirt.

5. The class, or grade, of wool and the station from which it came.

(*b*) *Auction Room.*

6. The auctioneer, who is in charge of the sale.

7. The men who have come to buy the wool.

8. To offer so much a pound for the wool as the auctioneer asks for bids for the various "lots."

9. Inspected the wool.

10. Many countries; about fifty countries send wool buyers to Australia, including Great Britain, Japan, the United States, France, Germany and Belgium.

11. Because by buying it at the port they have a larger selection to choose from, and they do not spend time in unnecessary travel.

12. Very large quantities.

13. Have it labelled, put on to ships, and sent to their employers in their native countries.

14. The auctioneer announces which lot of bales he wants to sell next, then asks for a price. Buyers who will offer ⅛d. more make a sign, such as lifting a pencil. When no one offers a higher bid, if he considers the price which has been reached a fair one, he drops his hammer, assigns that lot to its buyer, and starts with the next.

15. Furs, cotton, tea, coffee, etc.

Chart: 13. *Shipping the Wool.*

1. By cranes.

2. The hold.

3. Cargo.

4. Many steamers do: those which do not are called cargo boats.

5. In case of shipwreck passengers and crew "take to" such small boats, and if the boat is anchored outside a harbour they are used for rowing to the shore.

6. On rail-trucks.

Industries of Australia (Figs. 24–27).

1. Yes, because Australia is a big country with a big range of climates, and it also has a great deal of mineral wealth.

Exports: Wheat, wool, cotton, timber, pineapples, butter, eucalyptus oil, dried fruits, etc.

2. The eucalyptus or gum tree. The leaves and young shoots.

3. In case of accident he could ride for help.

4. No.

5. Bridges.

6. Because now that there are many more people in Australia than there were fifty years ago, the land is cut up into smaller farms; the Australian Government encourage this, partly because it is best to have as many men as possible working for themselves, and partly because on a smaller area a man can use more modern and "intensive" methods. The farms are still, however, very big compared with those in Great Britain. In the old days a man took on vast areas of land, but there was no expensive machinery to help him (and take up his money). Now that there are smaller, more efficiently run, stations, and more people in the country to supply capital, railways and bridges can be built.

7. Long: it would be of no use whipping up the oxen near the wagon if the front ones persisted in going slowly.

8. Mediterranean.

9. Grapes, some types of these yielding wine, others sultanas, others currants, and others raisins.

10. Dried fruit (currants, sultanas, raisins).

11. No A great deal of it is now manufactured into garments for the people in Australia.

12. No. Before 1851 there were few people other than the convicts in Australia, because the voyage was so long. The discovery of gold in 1851 attracted large numbers of people, and improvement in ships has since increased the number of settlers Hence, factories have been built, and the manufacture of goods in the country saves the cost of ocean transport and provides work for the increasing population This has meant a big loss to the wool manufacturers of Britain.

13. No. The separate machines are run from a central motor, by means of the "belts."

14. By electricity (see lamps in picture).

15. Sheep farmers; farm labourers; shearers; wool classers; teamsters; balers; railway guards; engine drivers; engineers; wool buyers; auctioneers; dock labourers; chemists; fruit farmers; fruit pickers; factory hands; machine minders, etc.

PICTURES OF LIFE IN INDIA

Practical Junior Teacher Chart "RICE IN INDIA" *and Pages* 536 *and* 537

SPECIMEN QUESTIONS

1. The climate of the greater part of India is similar to that of the country shown in the Chart. How would you describe it? (Give reasons.)

2. In what other country of Asia are rice fields flooded?

3. How are they flooded?

4. Why are the fields levelled?

5. How does the bullock assist in the agricultural work of India?

6. In which of these activities is its help most necessary?

7. Which of these things with which the bullock helps is it easiest for man to do alone?

8. Why is rice transplanted?

9. Who sow the rice seeds?

10. Who do the transplanting?

11. Of what scene in Great Britain does the picture of the rice-field remind you?

12. Why is this?

13. What are "Trial Lots"?

14. What is threshing?

15. What is husking?

16. How do you think this would be done to the larger part of the crop nowadays?

17. For what purpose besides grading it for sale would the rice be sorted?

18. What is evidently one test?

19. Why does the tracing of a pattern on the heap of rice grain prevent pilfering?

20. What is the difference between the meanings of *to thieve* or *steal* and *to pilfer*?

21. What is used to thatch the granary in Picture 12 of the Chart "Rice in India"?

22. Why is the granary built up above ground-level on bricks?

23. In what way is an underground granary better than one built in the open air?

24. What is the plantain?

25. Of what material are domestic utensils usually made in India?

26. Is the Brahmins' morning rice very like rice pudding as made in Great Britain?

27. When were the spices from the East more highly valued in England than they are to-day?

28. Why is a shelter built on the barges in India?

29. What other vehicles may be seen with similar covers in hot countries?

30. Are the methods of cultivating rice which are shown in the chart very different from those which have been used in India for hundreds of years?

31. In Picture 15 of the Chart what very modern object can you see behind the bags of rice?

32. How are the barges moved through the water? Will their passage be fast or slow?

33. Which is the hottest time of the day?

34. Why is India hotter than the British Isles?

35. Which is the larger, the British Isles or India?

36. What is used to make the bags in which the rice grain is packed?

37. Where is Calcutta? Find it in the map of India.

38. The land at the mouth of the River Ganges is called the Delta of the Ganges. What is a delta? Why is it so called?

39. What four great rivers of the world have deltas?

40. Look at the maps of Africa, Asia, and North America and find these four rivers. Write down in each case on which coast of the continent the river enters the sea.

41. What is a shopping centre called in India?

42. What head covering do many men of India wear?

43. Do the women wear turbans?

44. Notice that India is a peninsula. What English county is a peninsula?

45. How are the shops in the picture of the Indian bazaar different from most shops in Great Britain?

46. What metal would most probably have been used to make the big pots which are on sale?

47. What are the names of the most common Indian coins in use to-day?

48. Who has the better house—the shopkeeper, who lives over his shop in the bazaar, or the peasant (see Fig. 25)?

49. Of what are the peasants' houses made?

50. Where do they do their cooking?

51. What food is most usually being cooked?

52. What part of this plant is cooked?

53. What are the "seasons of the year" in India?

54. Name three ways in which animals are useful to man in India.

55. What is teak?

56. How does the elephant carry the timber?

57. In Fig. 26 an elephant is shown holding a piece of this timber. Which part of it is he grasping?

58. Would he carry the timber along in the same way?

59. Does the driver, or *mahout*, have to show him what to do each time?

60. Is the elephant a native animal of India?

61. How are wild elephants caught?

62. What English writer's books should you ask for at the Library if you wish to read stories of life in India?

63. What is the cheetah?

64. What other member of the cat family (one which you know very well) helps mankind by its hunting?

65. What is the name for an animal hunted and caught by another?

66. What is the difference between the treatment of their prey by the two animals mentioned in the answers to Questions 63 and 64?

67. What bird was used in England in bygone days as the cheetah is used in India to-day?

68. With which parts of their bodies do members of the cat family fight?

69. How does an elephant fight?

70. Who is a Rajah?

71. What article of furniture which is very common in English homes would you *not* expect to find in a house in India?

72. What form the border between India and Central Asia?

73. How has this affected the history of India?

74. In which part of India would you expect to find the original native people of the country?

75. What two peoples have come to India from the sea?

76. What two materials are named after Kashmir and Calicut?

77. What two places in Great Britain have given names to two woollen materials?

78. Name three kinds of mills which you would expect to find in India?

79. What use could you suggest for the rice straw and husks?

80. Which one of India's "spices" is very commonly found on the English dinner table?

81. How was trade between Europe and India carried on before the discovery of the sea route?

82. Who was the explorer who first discovered the way to India by sea?

83. What canal was cut to shorten the journey to India?

84. What is the quickest form of travel to India to-day?

85. What still very long sea trip from England to a British Dominion has been shortened considerably by the cutting of the Suez Canal?

86. How are elephant's teeth peculiar?

87. Of what material are the clothes of Indian peasants usually made?

88. Where is the raw material for their clothes grown?

89. Where might it have been manufactured?

90. How were the clothes of the people of India manufactured before the nineteenth century?

91. Why, when manufactured garments from Britain were exported to India, were many Indians willing to buy these when they could have them made by hand in their own homes?

92. What made people spend money in building mills in India?

93. What English county has this affected most? Why?

94. What new cloth manufacturing industry has grown up in England during the present century?

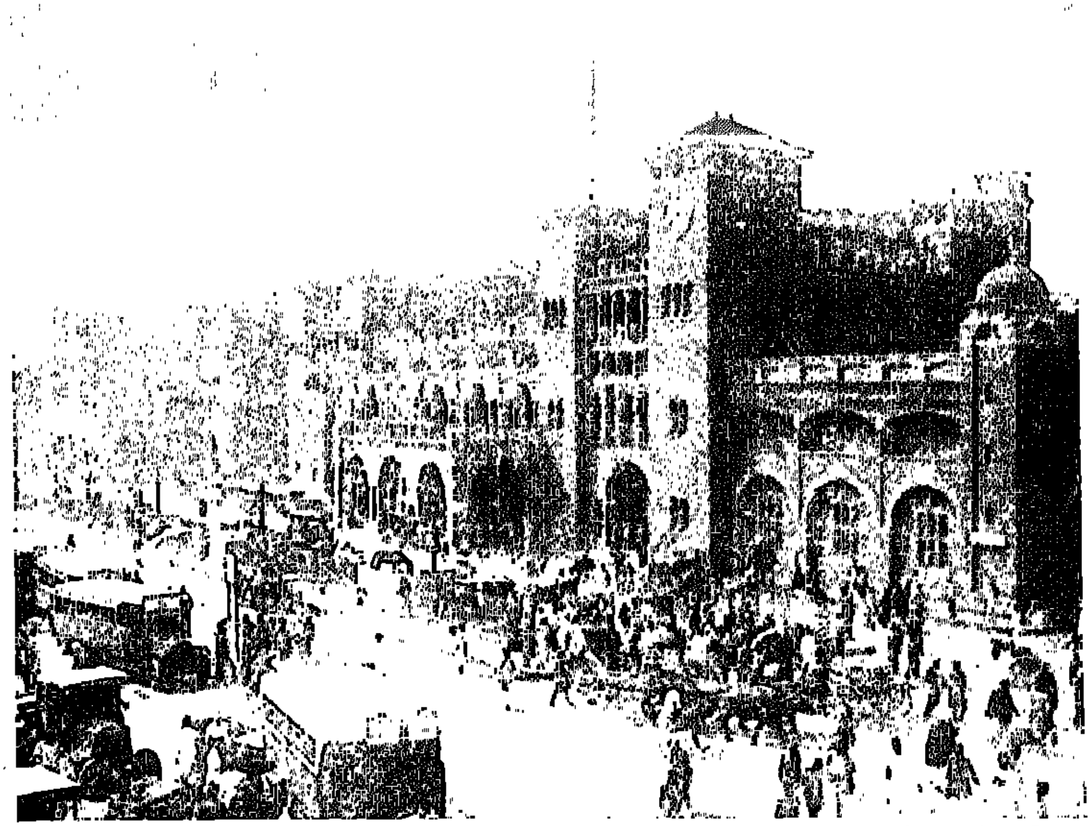
95. Why was margarine so much improved in taste and nourishing power during and after the years 1939–45?

96. How do we know that Indian civilization is older than British civilization?

97. What two great inventions common in Western communities originated with a civilized people of the East?

98. What method of transport has played a great part in the rapid development of Western civilization?

99. How do the men of India who are neither peasants nor priests earn their livings?



By courtesy of *Indian Railways Bureau*

FIG. 23

Howrah Station, Calcutta

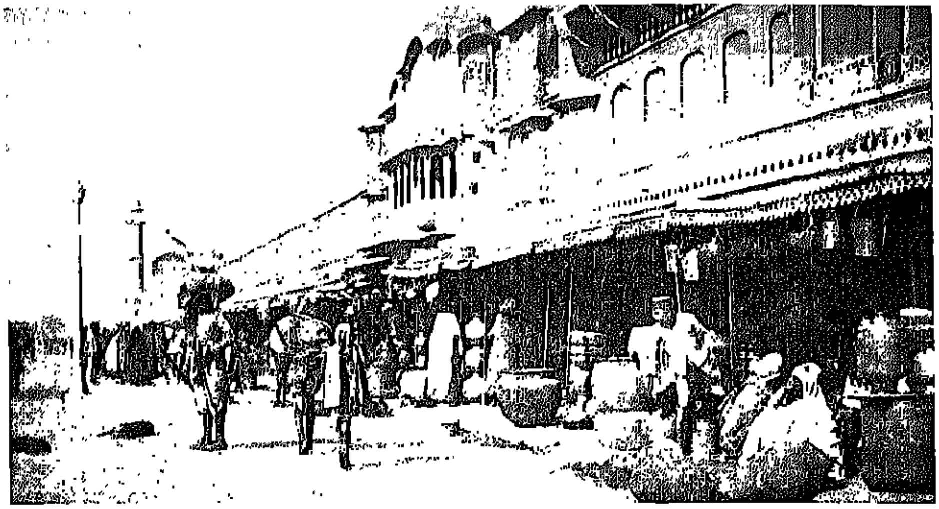


FIG. 24
The Bazaar, Jaipur, India

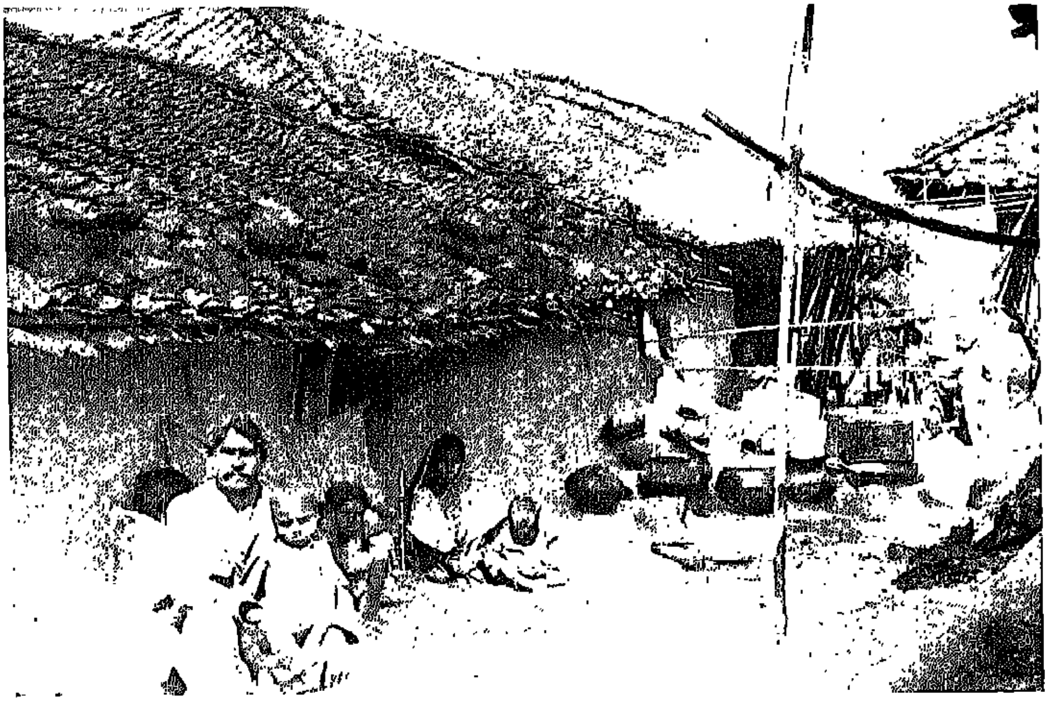
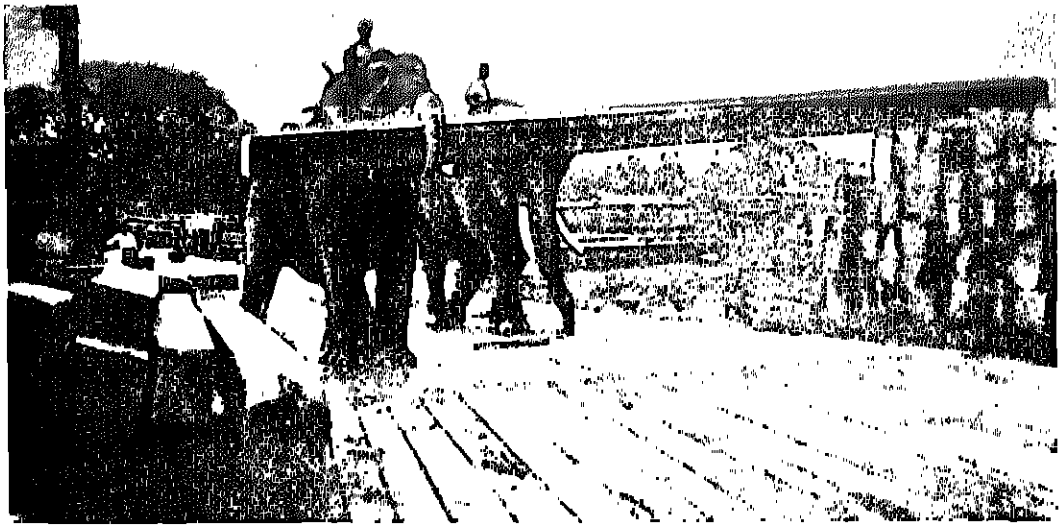


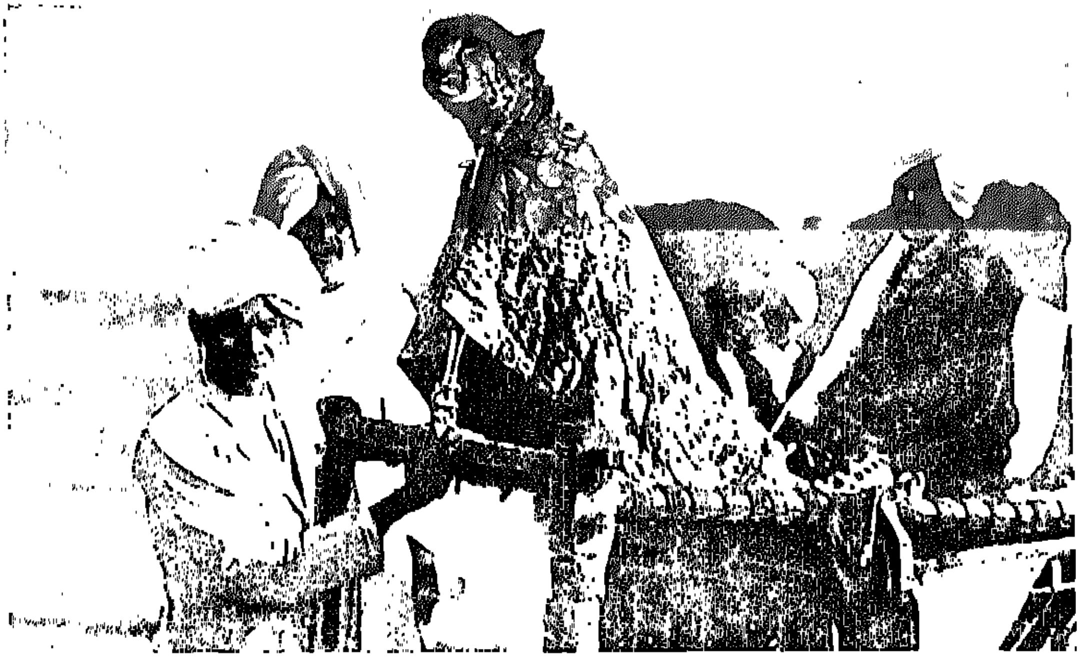
FIG. 25
Peasants at Home: India



By courtesy of *The High Commissioner for India*

FIG. 26

Elephants Piling Teak in Northern India



By courtesy of *The High Commissioner for India*

FIG. 27

Cheetah Hunting in India

PICTURES OF LIFE IN INDIA

OUTLINE ANSWERS

1. Climate is hot with a season of heavy rainfall—tropical. This is evidenced by the clothes of the people, the palm trees, shade over the barge, and the flooded rice fields.

2. In China.

3. When the wind which brings the rain—the *monsoon*—comes well-laden with moisture the rainfall is very, very heavy, and the fields are quickly flooded. If the monsoon rains fail the fields are now flooded from great "irrigation works" where water is stored in case of need.

4. To make the surplus water, which the soil cannot take in, drain off into canals along the sides of the fields. If this were not done it would be difficult for the seedlings to take root.

5. (i) Ploughing; (ii) drawing the flat piece of wood with which the fields are levelled; (iii) treading out the ears from the straw (threshing): (iv) transport (drawing carts).

6. Ploughing.

7. Levelling the fields.

8. Because it is scattered broadcast by hand, and the plants come up too close together for them all to get sufficient food from the soil.

9. The men.

10. The women.

11. A hay or corn field.

12. This is because grass, wheat and other corn, and rice all belong to the big plant family of grasses.

13. Small areas from which a little rice is taken and threshed by hand in order that the peasants may judge whether the grain in the neighbouring fields is ripe.

14. Breaking off the grain from the stalks, or straw.

15. Removing the outside covering of the seeds, or grain.

16. At a mill, by machinery.

17. So that the growers can tell which sort yields best and the effect of various conditions on the different types of the plant. This enables them to improve the crop.

18. Weight.

19. Because if any rice is taken the pattern is disturbed: even if the marked grains are not removed the taking of grain would make the pattern slip away.

20. Pilfering is stealing small amounts—it is sometimes called *petty* thieving.

21. Rice Staw.

22. Because the heavy rains flood the land at times.

23. It is the more easily protected from bad weather conditions.

24. The family of plants to which the banana belongs—all have large leaves.

25. Earthenware in the poorer homes. Brass also is used among the wealthier people.

26. No. It is cooked in water, with no milk or sugar, but is highly spiced. It is much firmer than the average English pudding.

27. Before the discovery of the New World, and the consequent introduction of a variety of new foods.

28. To give protection from the heat of the sun.

29. Carts.

30. No. Machine-driven mills have been introduced in some parts of India, but machines could not be used in the flooded fields. The British introduced railways into India, and this kind of transport is, of course, new, but the actual methods of cultivation are little changed, for they are those best suited to the country.

31. A lamp post.

32. By long oars. Their progress would be very slow except where it is helped by a fairly strong river current.

33. Midday, when the sun is most nearly overhead.

34. Because it is nearer the Equator—that part of the earth which is nearest the sun.

35. India, which is as large as all Europe without Russia. Look at the map of Europe and compare this area with the size of the British Isles in the same map.

36. Jute—fibres of a plant which has until now been successfully cultivated only in India. The plant is 11 to 12 ft. high, and is "retted" in water, as flax is, to loosen the fibres. Most of the spinning of jute yarn is carried out in the mills of Calcutta.

37. In N.E. India, at the mouth of the River Ganges.

38. Some rivers bring down so much mud from their higher reaches that, when they get to the low-lying land near the sea and begin to deposit it, it splits up their main streams into a number of "mouths," which spread out so that the mud deposit forms in time a roughly triangular-shaped piece of land. This is called a *delta* because the Greek character of that name, Δ (our letter *d*), is triangular.

39. The Nile, the Niger, the Ganges, and the Mississippi.

40. Nile: North coast of Africa; Niger: West coast of Africa; Ganges: South coast of Asia; Mississippi: South coast of North America (in Gulf of Mexico).

41. A bazaar (Persian word meaning *market*).

42. A turban—originally cloth wrapped round a fez. It was introduced into India by Mohammedans.

43. No. Unless they wear a veil, the *sari*, the cloth which is wrapped round the body, is taken across the head.

44. Cornwall.

45. They are open in front, instead of having windows.

46. Brass.

47. Rupee (silver coin); anna; pie.

48. The shopkeeper.

49. Mud walls, with thatched roof.

50. Outside the huts; one or two families may use the same fire (notice the oven in Fig. 25).

51. Rice. Millet is very common in some parts of India.

52. The seeds, or grain.

53. The cold season: November to February. The hot season: March to May. The rainy season: June to October. In the greater part of India the "cold" season is, of course, only comparatively cold.

54. E.g. oxen: ploughing, threshing, drawing carts, drawing water from wells. Elephants: transporting timber, building walls, and carrying *howdahs* in which the more wealthy people would ride (the motor-car is now replacing the elephant for the last purpose, and, whereas a wealthy man's riches used to be reckoned by the number of elephants he kept, it is now judged by his number of motor-cars). Cheetah: hunting. Mongoose: catches snakes and other vermin.

55. A tree largely grown in India. The timber is very hard and is used a great deal in ship-building.

56. In his trunk.

57. The end of it.

58. No, he would grip it in the middle, till he reached the pile. He must then drop it, place one end in position on the pile, and then take the other end and push it along until the whole length is in place.

59. No, the elephants are well trained and clever at their work. They have good memories.

60. Yes. It differs from the African elephant. Africa and India are the only countries where wild elephants are to be found.

61. They are driven into stockades or into pits by large numbers of men called *beaters*. After a time tame elephants are sent among them, and each wild elephant is finally led back to the camp between two tame elephants, who have wonderful control over their wild relations.

62. Rudyard Kipling's, e.g. *Kim* and The First and Second *Jungle Books*.

63. A type of leopard, which is tamed and trained to bring down game in India.

64. The domestic cat common in England, which hunts rats and mice.

65. The prey.

66 The cheetah must kill its prey but not eat it, because its master wants to take parts of it for food for himself; the cheetah will later receive what its master does not need. The prey of the domestic cat is not wanted for food by its master, and the cat is allowed to eat it straightway.

67. The falcon.

68. With teeth and claws.

69. With trunk, tusks, and feet (trampling on the enemy).

70 An Indian prince.

71. Chairs: the majority of Indians sit on the floor or on low couches.

72. The Himalayan Mountains, stretching for 1,500 miles, and containing the highest peaks in the world. Mt. Everest, at 29,002 feet, is seven times as high as the highest mountain in Britain, Ben Nevis. The sources of the Ganges, Indus, and Bramaputra are in the Himalaya.

73. Fighting tribes from the high lands, envying the wealth of the agricultural people of the plains, have come down and conquered them, in their turns settling down into agricultural habits and being conquered by other peoples.

74. In the south, because the invaders came from the north and they have been pushed farther and farther south, some having taken refuge in Ceylon.

75. Europeans and Persians. The latter were driven out of Persia on account of their religion, and settled in Bombay, where they have successfully carried on trade for many years They are known as Parsees.

76. Cashmere and calico.

77. Tweed and Paisley.

78. Jute, cotton, and rice mills.

79. Straw for thatching; husks for fuel.

80. Pepper.

81. By caravan which travelled overland by way of Persia and Asia Minor. Trace this route in your altas.

82. Vasco da Gama, a Portuguese, was the first to sail round the south of Africa and so across to India. Trace out this route on the map of the world. Da Gama returned to Lisbon from this voyage two years after setting out. We can now get there in less than two weeks by sea.

83. The Suez Canal, which enables ships to pass from the Mediterranean Sea into the Red Sea, and thence from the town of Aden straight across to India. Look at the map of the world and compare this route with the old route round the coast of Africa.

84. By airplane.

85. The journey to Australia. This takes about six weeks by steamship.

86. Instead of ordinary front teeth, the elephant has two very long "tusks," which are useful for fighting and for digging up roots for food. Though he has twenty-four back teeth the elephant uses only four at a time, two pairs in each jaw; as one tooth is worn out another moves forward.

87. Cotton cloth.

88. In India for the most part.

89. In India or in Great Britain.

90. By hand in their own homes.

91. Because it saved them labour, and they could earn, in other work, more than they spent on the garments.

92. The facts that cotton cultivation in India was increasing and that there is a good market there because there is a very large population. Because the cost of shipping the goods is saved, the manufacturer's cost is less.

93. Lancashire. Because most of the cotton manufacture is carried on there, and India's cotton goods used to supply work for many of the local people.

94. The manufacture of artificial silk from wood pulp.

95. Because during the World War it was difficult to get butter so more time and money were spent on encouraging people to buy the substitute for butter.

96. From the tales of travellers of other Western lands whose civilization is older than ours (Alexander the Great invaded India over a hundred years B.C.), and from the records of the literature and many beautiful ancient buildings of India.

97. Paper and gunpowder (first known to the Chinese).

98. *Sea-going ships, which brought the people* of Europe into contact with other peoples.

99. As clerks, civil servants, and Government officials, as officers and men of the Indian army, as doctors, lawyers, land-owners, etc.

AT HOME: IN A LAND OF ICE AND IN A LAND OF SUNSHINE

SPECIMEN QUESTIONS

1. Of what is an Eskimo *igloo* made?
2. Of what have the natives of South Africa in Fig. 29 made their home?
3. Which of these homes would last longer?
4. What part of a house is sometimes made of a kind of grass in England?
5. What sort of clothes do Eskimos make for themselves?
6. What sort of clothes do the black tribes of South Africa make for themselves?
7. What weapon is used for hunting by both Eskimos and South African natives?
8. How do these peoples learn to make their dwellings?
9. Why should the Eskimo woman carry her baby in a hood of her coat?
10. Are the natives of South Africa shown in Fig. 29 wearing hats?
11. What feature is common to the doorway in both the igloo and the South African hut?
12. Name one kind of food which forms a large part of the diet of both the Eskimo and the South African native.
13. What native races which are his near neighbours does the Eskimo resemble?
14. Are the native tribes of South Africa very like one another?
15. How does the interior of the igloo resemble that of the South African grass hut?
16. How is the roof of the grass hut supported?
17. What makes the roof of the igloo keep in position?
18. Name a likeness and a difference between the hair of the Eskimo and that of the South African native.
19. What is the chief pastime of South African natives?
20. What is there common to dancing all over the world?
21. If a people have no arts or crafts of any kind, living just from day to day, with no interest in their dwellings except as shelter, as for instance the pigmy of the Congo region, we call them *savages*. When a people learn to tame animals and make use of them, to till the soil, to make laws for themselves, and to develop a sort of community life in their dwelling-places, we speak of them as *barbarians*. When a people learn to read and write we speak of them as civilized: such a development does not occur until a people lead a much more settled life and feel strongly the need to record such things as the great deeds of their leaders. Which of the three names just explained would you give to the Eskimos and to the natives of South Africa?
22. Which of the two peoples shown on pages 542 and 543 would spend most time inside their dwellings?
23. Where would these peoples build their fires?
24. What artificial light would be used in these dwellings?
25. What animals would the natives of South Africa kill for food?
26. What animals would the Eskimos kill for food?
27. What domestic animals have the two peoples whose homes are shown in pages 542 and 543?
28. Do the natives of South Africa till the soil?
29. What big difference, due to the effect of the climate on the food, is there between the hunting of the Eskimo and the South African?
30. Are these two peoples living to-day in ways quite natural to them?

NOTE. *It must be remembered that it is impossible to describe in unequivocal terms the lives of uncivilized peoples to-day, owing to the various degrees to which they are influenced by Western civilization. Many Eskimos and South African natives, for instance, live in corrugated iron huts near the settlements of white people.*

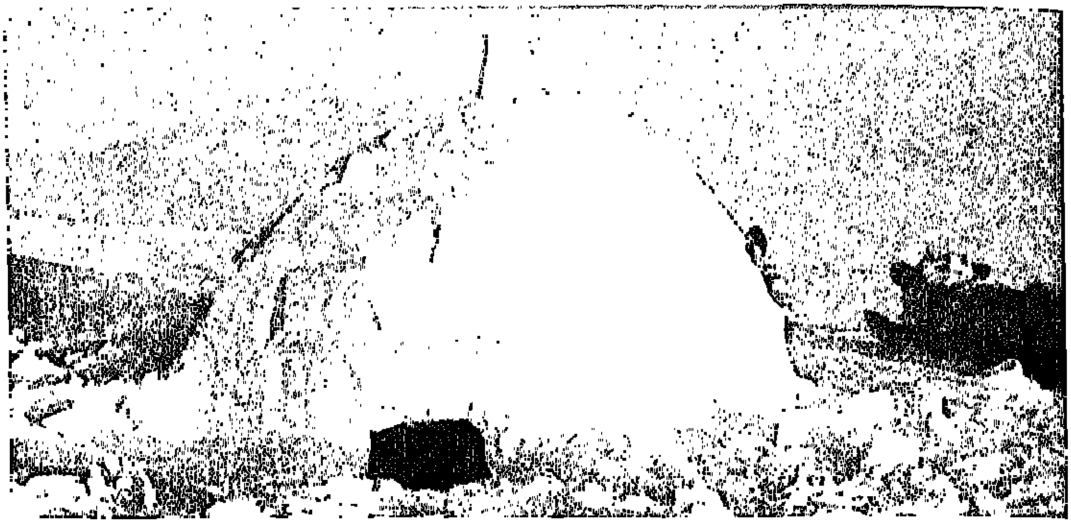
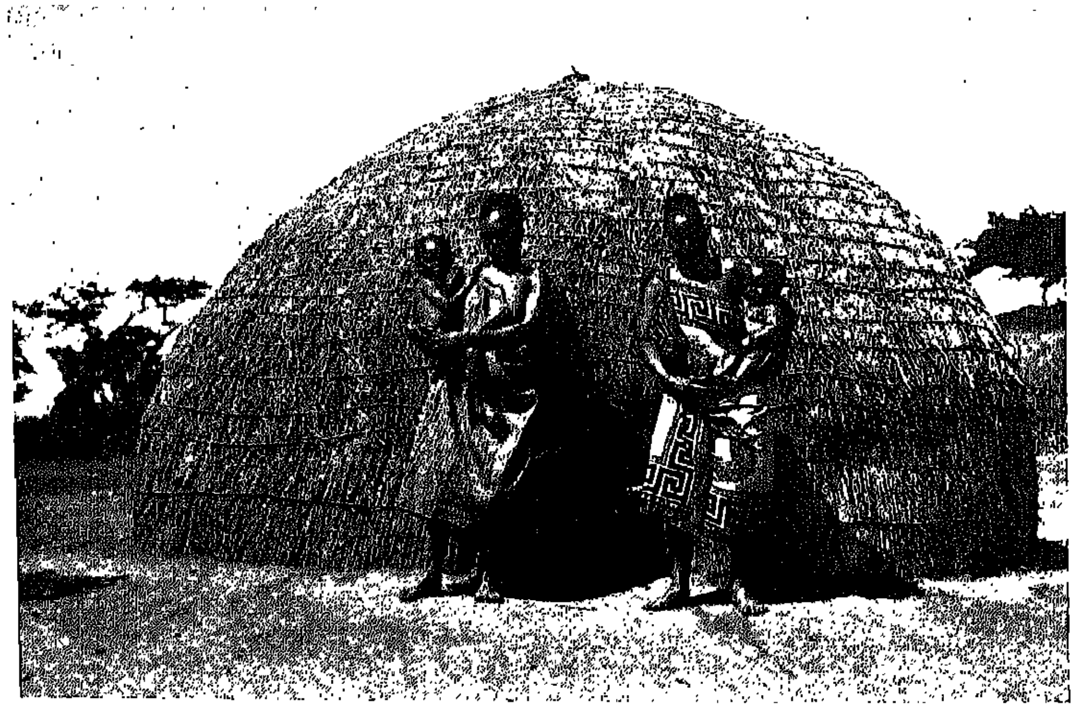
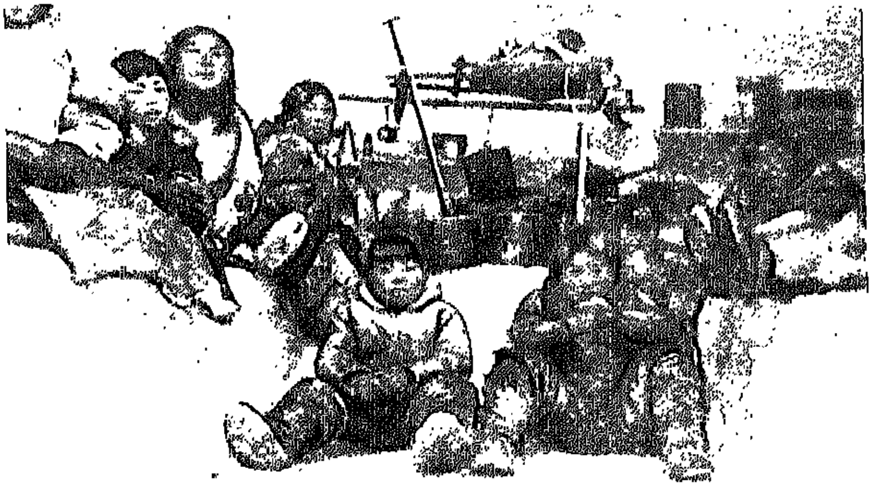


FIG. 28
An Eskimo Igloo



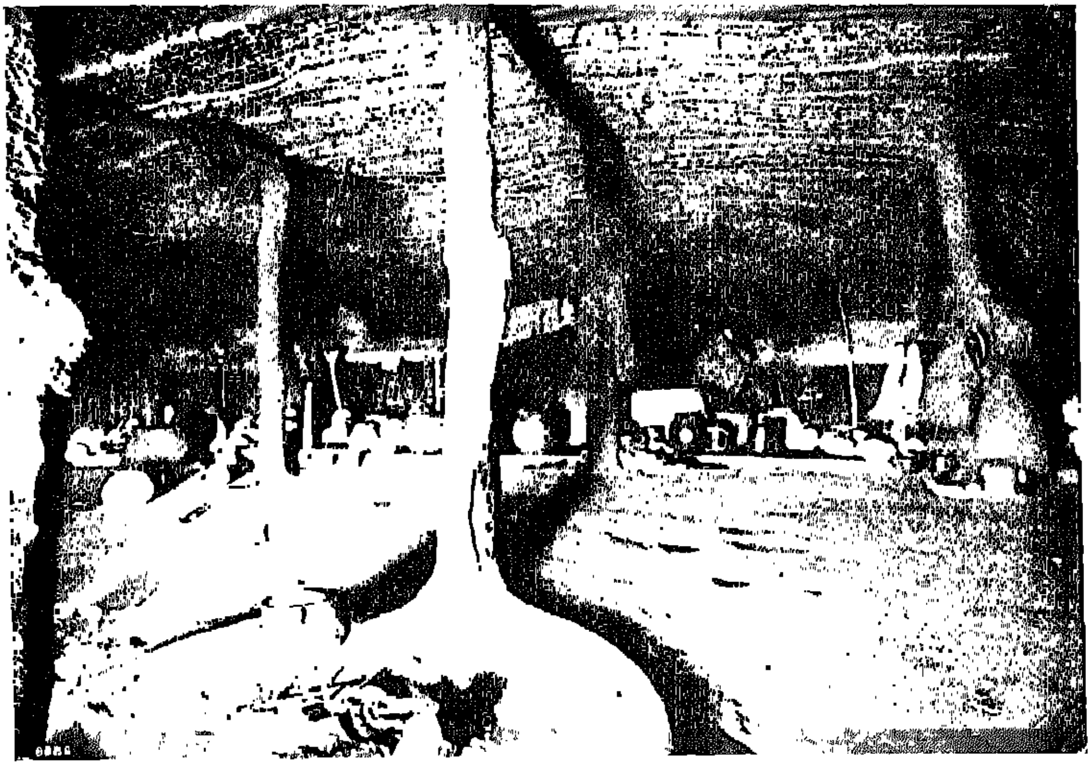
By courtesy of *South African Railways*

FIG. 29
South African Natives Outside Grass Hut



By courtesy of *Hudson's Bay Company*

FIG. 30. *Inside the Igloo*



By courtesy of *South African Railways*

FIG. 31. *Interior of Native Hut, South Africa*

AT HOME: IN A LAND OF ICE AND IN A LAND OF SUNSHINE

OUTLINE ANSWERS

1. Blocks of ice.

2. Of grass, with supports of tree-trunks.

3. The grass hut, for the ice of the igloo melts in the spring-time.

4. The roof (thatch).

5. Clothes made of fur or leather—none of their animals or plants provides them with material for weaving.

6. None. Skins are sometimes prepared, but for ornament rather than for covering. Blankets (brightly coloured) are bought from white traders.

7. The spear.

8. By being shown how to do it by their fathers.

9. So that she may have her hands free for work. Among uncivilized peoples all over the world the mothers sling the babies on their backs in various ways for this reason. It is only in civilized communities that we find women confining their work to the house after marriage.

10. No. Their hair is drawn up in a peculiar way so that it looks rather like a fez.

11. It is very low, so that it may be covered easily.

12. Meat.

13. The Red Indians and the Chinese.

14. Yes, in many ways. All belong to the Negroid race of men, but the various tribes differ even to-day in habits and customs, as well as to some extent in physique.

15. "Furniture" such as we have in our homes is lacking, all the contents being connected with the absolute necessities of life—cooking pots, food, weapons, tools, skins for couches and coverings. (Note in igloo frame for drying clothes over lamp.)

16. By logs of wood planted in a circle inside.

17. The skilful placing of the blocks of ice, which become frozen into a solid mass.

18. In both cases the hair is black. The hair of the Eskimo is oily and straight. The hair of the South African native is woolly and curly.

19. Tribal dancing.

20. Movement to the rhythm of a tune or chant.

21. Both peoples are naturally barbarians, but are acquiring Western civilization by their contact with white men.

22. The Eskimos. In a hot climate the dwellings are used little except for sleeping, and for shelter during the heavy rains. The Eskimos, however, spend much of their time in the igloos during the winter, especially during that time when there is no light from the sun.

23. The natives of South Africa make fires outside their dwellings, for it would be too dangerous to have them inside the grass huts. Eskimos do not make fires, but get light and heat from oil lamps. Except for those living in settlements made by white men, these people eat their meat and fish raw or boil it over the lamp.

24. The Africans do not have artificial lights in their huts. They sit round a big fire in the middle of the village, or kraal. The Eskimos get both light and warmth from lamps fed with oil from seal blubber.

25. Chiefly antelopes and zebras. In bygone days also the larger animals such as the elephant and hippopotamus, but it must be remembered that with the advance of civilization the natives do not depend upon their hunting as they did formerly.

26. Seal, whale, fish, and occasionally polar bear.

27. Eskimo: reindeer, and dogs (huskies). South Africans: "Afrikander" cattle.

28. Yes. Maize is largely cultivated.

29. The Eskimo can store some of his meat and fish in the cold climate of the north. In South Africa the natives must eat their prey within a comparatively short time after killing.

30. No. Instead of developing slowly they have suddenly been brought into contact with the advanced civilization of the West. Notice other peoples in whose histories this has occurred, e.g. the Jews at the time of their conquest by the Babylonians, and the British at the time of the Roman Conquest.

OCCUPATIONS FOR WORK-TIME AND LEISURE

SPECIMEN QUESTIONS

1. On each of the two pages 546 and 547 there is the same difference between the two pictures shown. What is this difference?

2. Most forms of amusement have a definite usefulness. What do you think it is in the two examples shown in these pages?

3. Where was the photograph of the trapper taken?

4. What is the name of the mountains shown in the picture of winter sports, and to which countries besides Switzerland does this range extend?

5. What is the use of the trapper's dogs?

6. What animal are they very like? Is this latter animal useful to man in any way?

7. What two forms of water are shown in the pictures of the trapper and the winter sports?

8. How will the trapper get to his next ice-hole?

9. What is the name of the trees in the winter sports picture?

10. When do children have a similar tree for parties?

11. What is the most striking thing about such trees?

12. What are there in the picture of Switzerland that are not to be seen in the picture of the trapper?

13. Why would the trapper make a hole in the ice?

14. Why do the two side pieces of the sledge—the runners—curve upward?

15. Why do the hairs of the dogs all lie in one direction?

16. If it were not for the sledge, what very different type of country might you take the Arctic picture for?

17. Which of man's senses suffers in both these regions?

18. What can you see in the Swiss picture which would be useful for building dwellings?

19. Is there anything in the Arctic picture which could be used to build a dwelling?

20 What is the use of the boats in the picture of Cornwall?

21 What makes the boat go along?

22. How are the boats in the picture of Windsor propelled?

23. What is the chief use to which rope is put in the Cornish boats?

24. What is the use of the rope in the boats at Windsor?

25. What is the name of the river in the picture of Windsor?

26. What name would you give to the houses in the Cornish picture?

27. Of what famous building is the big round tower at Windsor a part? What important person resides there sometimes?

28 What country is shown in both the pictures on page 547?

29. What is the chief difference between the trapper's reason for fishing and that of the Cornish fishermen?

30. Are boats generally spoken of as male or female? In which picture is there a proof of this?

31. Why were the windows of old stone towers made long and narrow?

32. There are two objects shaped like bananas hanging on the outside of one of the Cornish boats. What purpose do you think they serve?

33. Why are sails movable?

34. What do you think the country is like at the back of the Cornish village?

35. Where is Cornwall? What is the name of the county next to it?

36. What place in Cornwall has a name which tells you something about this county?

37. In what popular saying is this used? Explain the meaning of it.

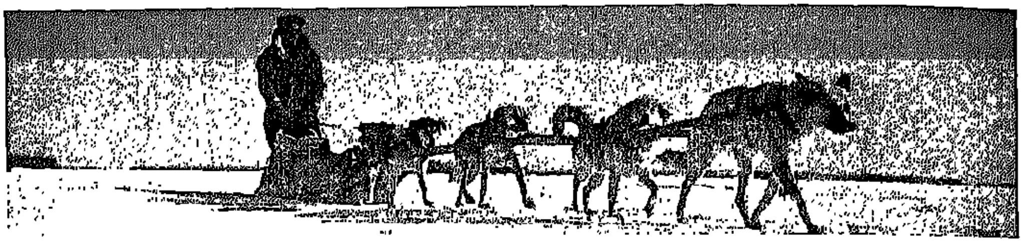
38. What mines are found in Cornwall? How did they affect British history?

39. In what way of earning a living do the Swiss people resemble the Cornish?

40. Who was the first king of England to reside at Windsor?

41. In what sports would people at Windsor be likely to amuse themselves?

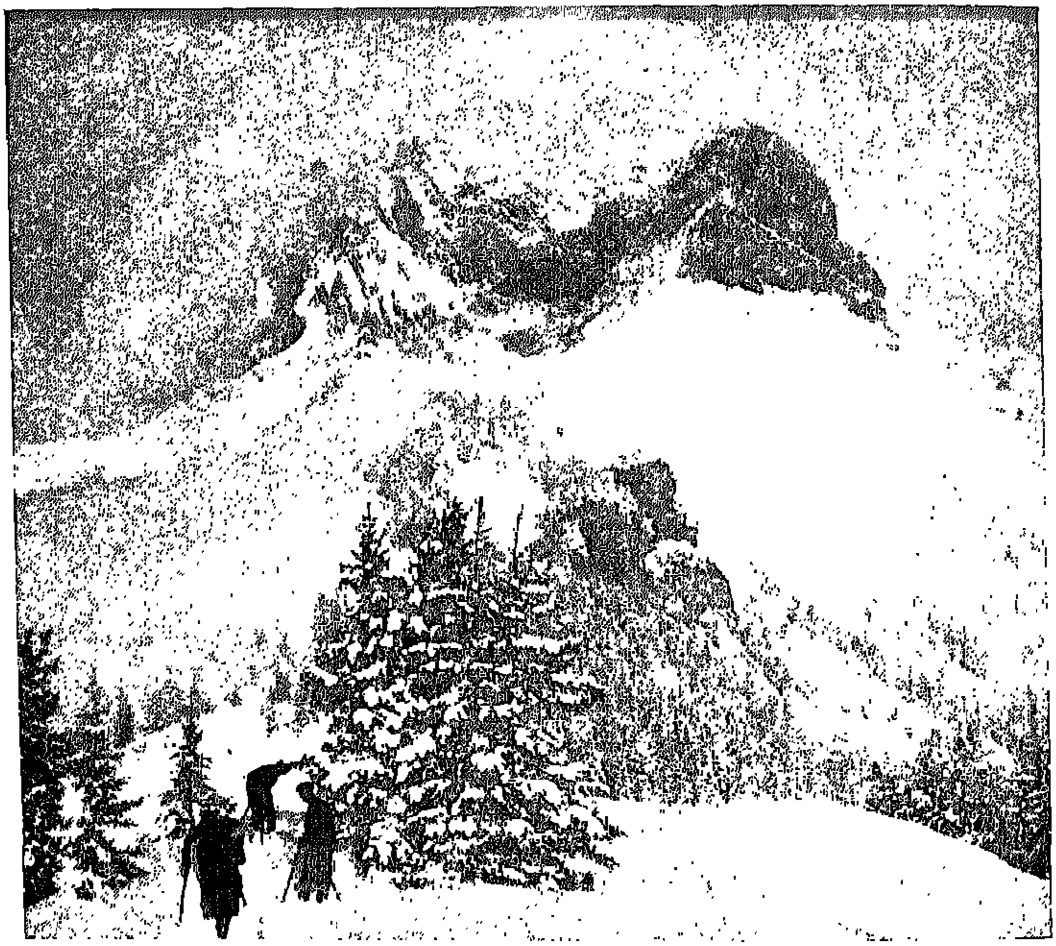
42. At what time of year was the photograph taken of (*a*) Switzerland, (*b*) Windsor?



By courtesy of *The National Film Board of Canada*

FIG. 32

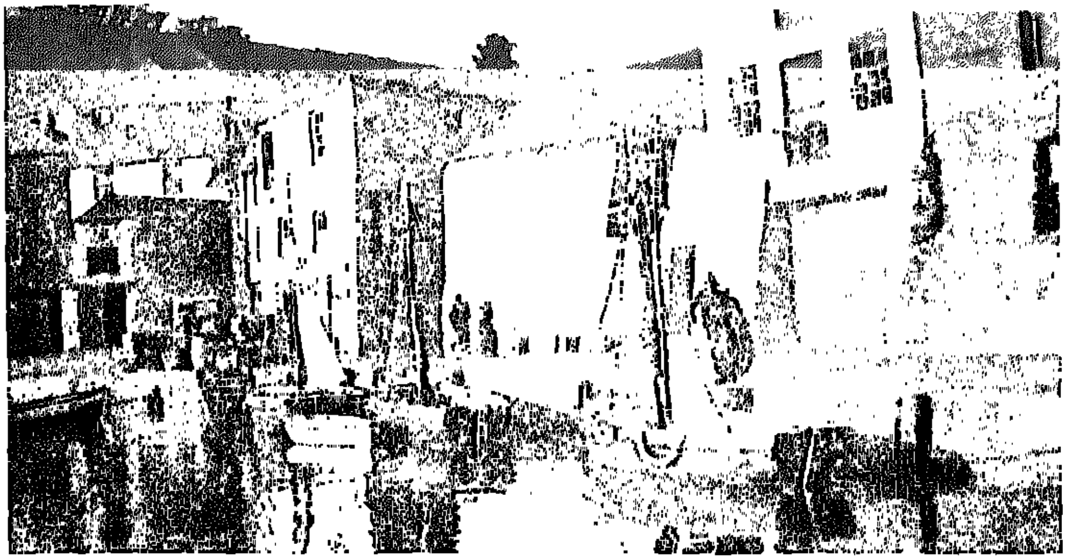
Hudson Bay Trapper with Dog Team



Kodak Snapshot

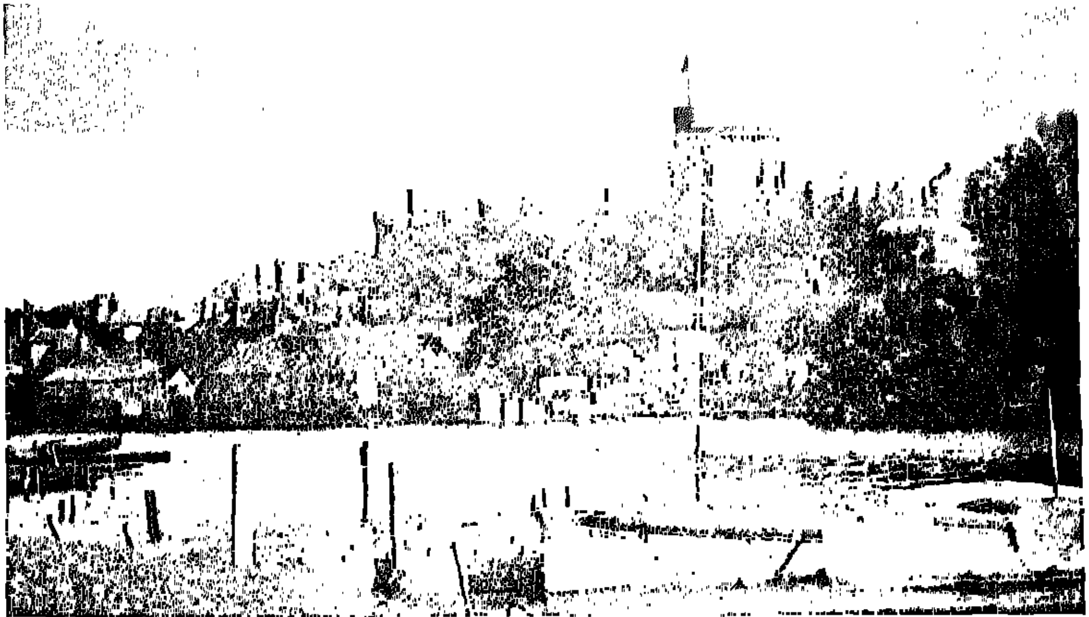
FIG. 33

Winter Sports in Switzerland



Kodak Snapshot

FIG. 34
A Fishing Village in Cornwall



Kodak Snapshot

FIG. 35
A View of Windsor Castle

OCCUPATIONS FOR WORK-TIME AND LEISURE

OUTLINE ANSWERS

1. The ice in the one page and the boats in the other are shown in the top picture as part of a man's work and in the lower picture as a means of amusement.

2. Outdoor exercise is definitely useful in helping to keep people healthy and thus able to do their work well.

3. In the Arctic regions.

4. The Alps. Italy, France, Germany, and Austria.

5. To draw the sledge.

6. The wolf. Yes, his hair can be used as a warm covering, but he is hunted to prevent his doing damage rather than for his skin, which is less popular than the pelts of many other Arctic animals.

7. Snow and ice.

8. On his sledge, pulled by the dogs.

9. Fir trees.

10. At Christmas time.

11. The needle-shaped leaves.

12. Trees and rocks.

13. Because the sea, owing to its constant tidal movements, is frozen only on the surface. Therefore he can make a hole, set his net, and find fish in it when he revisits the hole.

14. To prevent them from digging into snowdrifts.

15. So that rain and snow will easily slide off them, as they do off the overlapping tiles on the roof of a house. Also, they thus cover the skin more closely, so keeping out cold

16. A sand desert.

17. Sight.

18. Timber from the fir trees.

19. Ice.

20. For fishing.

21. The wind.

22. By oars.

23. In the rigging, because it is a sailing boat.

24. To prevent them from drifting.

25. The River Thames, Windsor.

26. Cottages.

27. Windsor Castle. The King of England.

28. England.

29. The trapper wants fish for food for himself and his dogs. The Cornish fisherman's chief use for the fish he catches nowadays is to sell them, so that he may buy goods produced by other people, many of these coming from other parts of the world.

30. Female. The name "Lady Glad" may be seen on one of the boats in the picture of Windsor.

31. Because they enabled archers to shoot at enemies without exposing themselves to view.

32. These are buffers, to prevent damage when the boat bumps against the jetty or another boat.

33. So that they can be set to catch the wind when it blows from various directions. Great skill is needed to sail a boat, because a great difference is made in the speed and the course of the boat by the angle at which the sails catch the wind.

34. Hilly and rugged, but well wooded.

35. In the south-west corner of England. Devon.

36. Land's End—this tells you that the county stretches out into the sea.

37. "From Land's End to John o' Groats." This means from one end of the country to the other, for John o' Groats is the name of a place near the most north-easterly point of the British Isles—in Caithness, Scotland.

38. Tin mines. The Romans were tempted to conquer Britain largely by the wealth of Cornish tin, which was very valuable to them.

39. Catering for visitors, who are attracted by the beautiful scenery.

40. William the Conqueror.

41. Boating and fishing.

42. (*a*) Switzerland: winter. There is not sufficient snow and ice to allow of "sports" in summer.

(*b*) Windsor: late spring or early summer. Trees in leaf and chestnut tree in bloom.

"CREATION OLD AS HOPE AND NEW AS SIGHT"

SPECIMEN QUESTIONS

1. What does the Sphinx represent?

2. What are the pyramids of Egypt?

3. Why was the Sphinx built near the Pyramids of Gizeh?

4. Gizeh is near Cairo. What sort of region surrounds it?

5. What is sand?

6. Of what are the pyramids and the sphinx composed?

7. About how long ago were they built?

8. How did the working conditions of the builders of Ancient Egypt differ from those of the British builder to-day?

9. Have people ever carried out building in Britain under similar conditions?

10. What very old Egyptian monument stands on the Thames Embankment in London to-day?

11. Why is its name not suitable?

12. What is an interesting fact about (*a*) the past, (*b*) the future of this monument?

13. What trees are shown in the photograph of the pyramids (Fig. 37)?

14. Why are these trees to be seen in this photograph but not in that which shows the Sphinx?

15. How is the camel useful to the people of Egypt?

16. Are the Arabs of the Sahara desert really the native race of Egypt?

17. What was the name of the great religious teacher under whose guidance the Arabs conquered Persia, Syria, Egypt, and Spain?

18. What change occurred in the writing of numerals in Europe as a result of the spread of Arabic influence?

19. In Fig. 37 what is the difference between the shadows on the sand and the reflections in the water?

20. What name do we give the reflection of an oasis which sometimes deceives the traveller in the desert?

21. To what great family do the Egyptian bullock and the American buffalo belong?

22. What important town in America is named after the animals shown in the picture of Alberta? Find it on the map.

23. What is the more correct name for the buffalo of North America?

24. What are distinctive features of these animals?

25. Why do the herds roam about from place to place?

26. What is the use of the bison's hump?

27. What is the name of the range of mountains shown in the picture of Alberta?

28. Why does the bison have hard "hoofs" and the camel broad feet with fleshy pads?

29. Of what use is the pine's *resin* to the tree?

30. What are the natives of Australia called?

31. What are two items of their diet?

32. What is a turtle?

33. In what way is it like a bird and in what way like a fish?

34. What other insect does the ant resemble in its way of organizing the life of the community?

35. What is the chief difference between the Australian ant-hill and one that you would find in your garden?

36. Where does the earth which forms the "hill" come from?

37. What warmth hatches the eggs of the turtle and of the ant?

38. What sort of people are Australian aborigines? (Notice the cricket belt which one of those in Fig. 40 is wearing.)

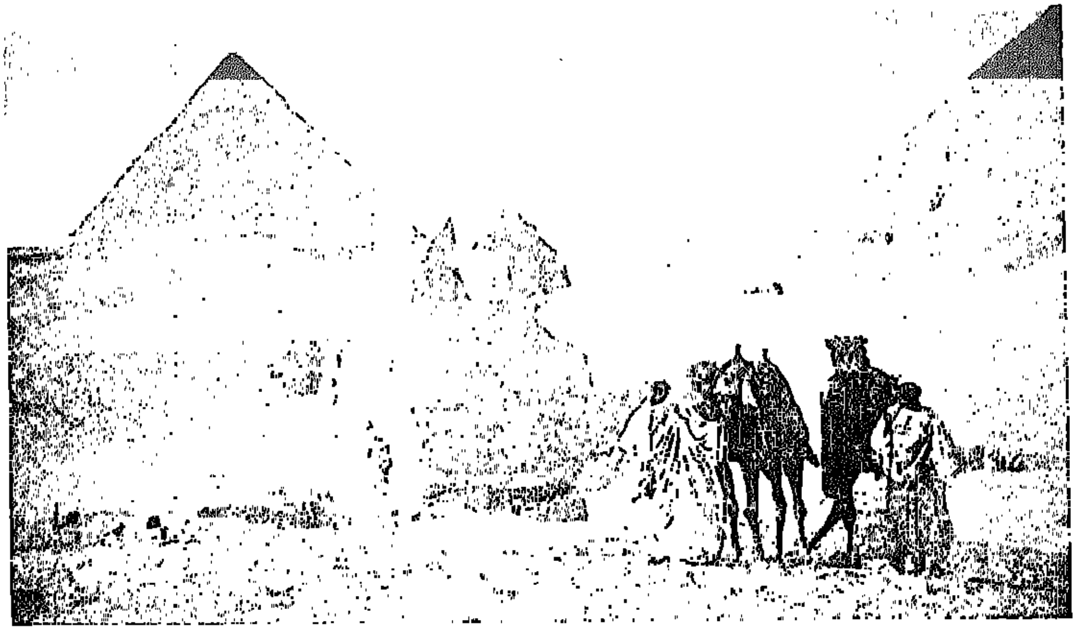


FIG. 36
The Sphinx, Egypt

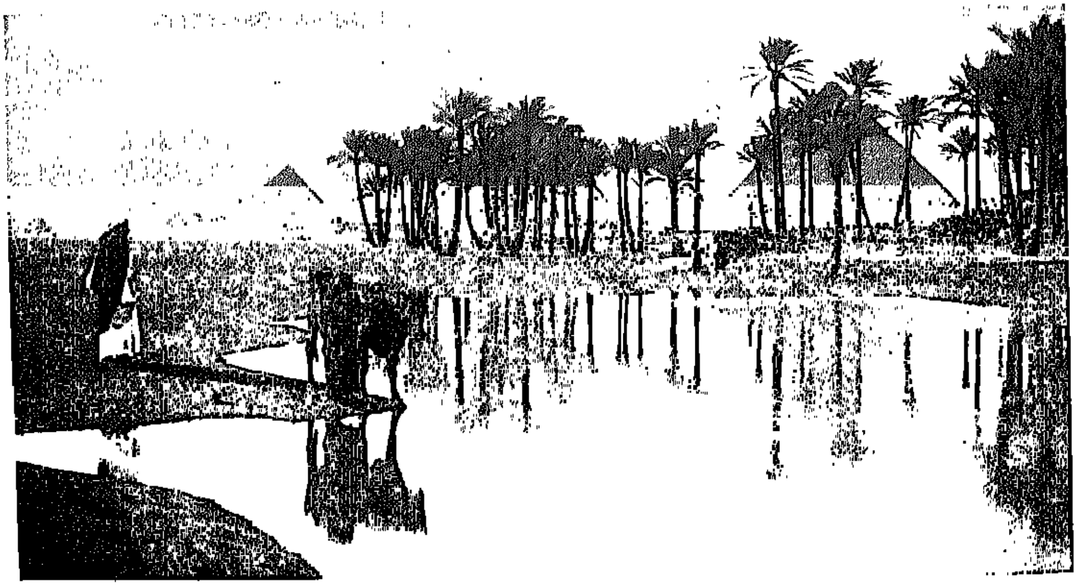


FIG. 37
The Pyramids of Gizeh, Egypt

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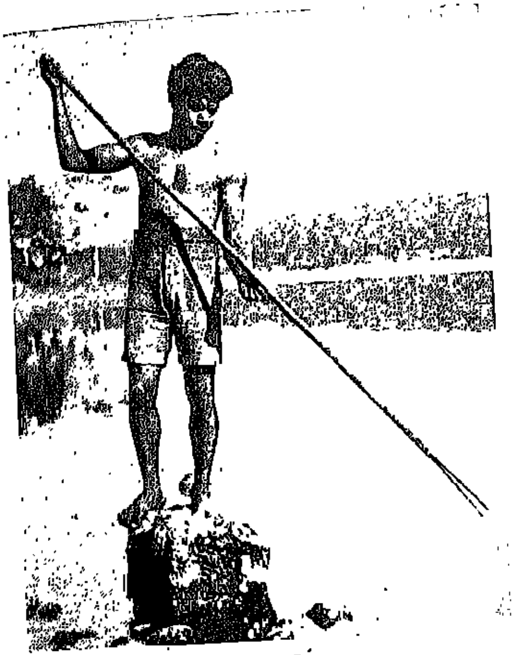


FIG. 38

Aborigine Spearing Fish, Australia

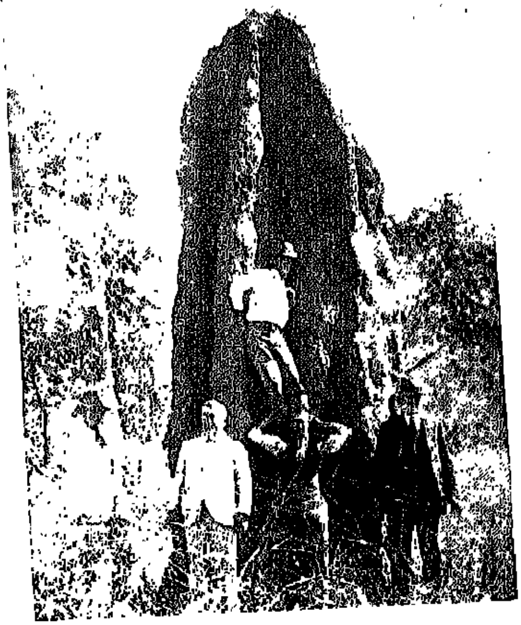
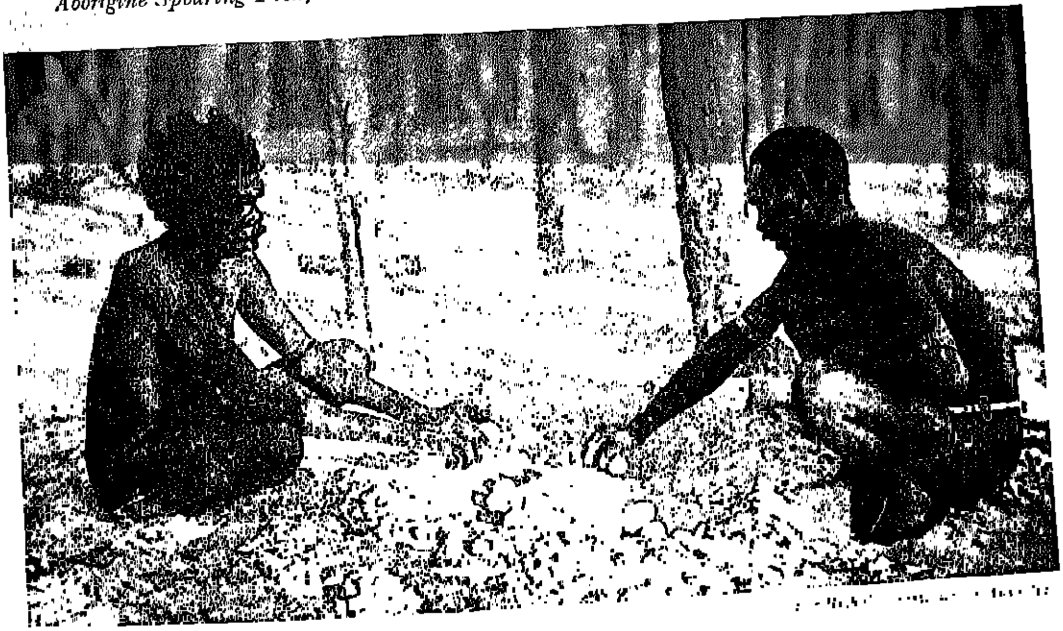


FIG. 39

White Ant Hill, Australia



By courtesy of

FIG. 40

A Turtle's Nest, Australia

"CREATION OLD AS HOPE AND NEW AS SIGHT"

OUTLINE ANSWERS

1. One of the goddesses of the Ancient Egyptians. It has a woman's head and the body of a lion.

2. Tombs of kings (Pharaohs). Food, clothing, and weapons were buried with the bodies, which were embalmed and wrapped up in linen (mummies). The Egyptians believed that the spirit of the dead returned for the body and the possessions of its earthly life.

3. That it might guard the tomb of the Pharaoh who built the second Pyramid.

4. A desert of rock and sand—the Sahara.

5. Tiny particles of rock. The rock is split by the sudden change from hot day to cold night, and the strong winds rub the pieces together, so that they become ground down into sand.

6. Great pieces of stone brought from a distance by vast numbers of men.

7. Over four thousand years ago.

8. The builders of Ancient Egypt were slaves.

9. Yes, for instance after the Roman and Norman conquests the people of Britain were in some cases made to work as slaves or serfs.

10. Cleopatra's Needle, near Westminster.

11. Because it was not made at Cleopatra's order, but a long time before her days—probably she used it as a monument, with another similar monolith, for one of her buildings.

12. (*a*) It is carved out of one huge stone, and was floated down the Nile from the place where it was made to the town of Heliopolis; later the casing of a ship was built round it and it was towed to England and erected on the Embankment to save the danger of further transport.

(*b*) When it was erected a number of articles of present-day use and a translation of the Egyptian writing (*hieroglyphics*) on the stone were placed inside the pedestal on which it stands.

13. Palm trees.

14. Because there is a water-hole nearby.

15. As a mount for riding, as a beast of burden, and as a source of milk, butter, and cheese.

16. No. They were originally the native people of Arabia.

17. Muhammad (sometimes spelt Mohammed).

18. In the eighth century A.D. European countries began to adopt the Arabic numerals which we use to-day: they are simpler than the Roman numerals.

19. The shadows lie along the sand but the reflections go straight downward into the water.

20. A mirage. It is best to tell Juniors that the cause cannot be explained to them until they are older and learn something about light rays.

21. The ox family.

22. Buffalo, in the State of New York, U.S.A.

23. Bison.

24. They have a hump on the shoulders and in winter the front part of the body is covered with thick, shaggy hair.

25. In search of fresh pastures.

26. It is made of muscles, which enable the animal to lift its remarkably heavy head.

27. The Rocky Mountains.

28. The bison's hoofs enable it to travel safely and comfortably over grasslands. The pads on the feet of the camel enable it to keep its foothold on the rock and sand of the desert.

29. The resin makes it more difficult for insects to bite a way into the trunk and boughs. Many insects in a cold climate find a safe and warm winter hiding-place for their eggs beneath the bark of these trees. Also the resin covers up wounds in the bark.

30. Aborigines.

31. Fish and turtle eggs.

32. A sea-tortoise.

33. They hatch out of eggs, as birds do, and are cold-blooded like fish.

34. The bee. There are queen, drone, and worker ants

35. The Australian ant-hill is very much larger.

36. In making little "rooms" under the earth the ants excavate soil and with this the hill is built up above the earth also.

37. The heat of the sun. The parent does not "sit" on them, as birds do.

38. Savages. There are comparatively few of them alive to-day. They are very shy and live in very rough shelters made by pulling together boughs of trees.

FOUR DIFFERENT KINDS OF SHOPPING

SPECIMEN QUESTIONS

1. What is shopping?

2. What do you generally give in exchange for the goods you buy?

3. What will the black bear get on his "shopping" excursion?

4. What will he give in exchange for it?

5. Where is Syria?

6. What are the oranges like which come from there?

7. From what country do we get the bitter-flavoured Seville oranges used for making marmalade?

8. How does the roof of the house shown in the picture of Syria differ from the roofs of most British houses?

9. What races are to be seen in the Syrian market?

10. What country often mentioned in the Bible lies to the south of Syria?

11. What name is usually given to the sort of "shops" shown in the pictures of Syria and of Holland?

12. What are the people of Holland called?

13. Why do the people of Holland wear wooden clogs?

14. In what parts of Australia do you think the pedlar comes round with his goods in a cart or lorry?

15. What is the Australian "bush"?

16. What advantage has the lorry over a horse and cart?

17. What advantage has the horse and cart over a lorry?

18. What great discovery has practically done away with the travelling pedlar in England?

19. How long is it since he was a very familiar figure in the countryside of Britain?

20. What day do we call that which is fixed specially for shopping purposes?

21. In which of the four countries here mentioned is the native race uncivilized?

22. There is a likeness between the ways in which the Dutch peasant and the Australian farmer get the money for their shopping. What is this?

23. In which of the countries shown in these pictures is most snow to be seen, and in which least snow?

24. On what sort of plant does the orange grow?

25. What is the language chiefly used in each of the four countries shown here?

26. In the picture of Syria there is a man whose head-covering resembles that of the little Dutch girl. What do you think is his nationality?

27. What beast of burden is useful in Syria because of the hills?

28. What animal which is never used as a beast of burden in Britain is used to draw carts in Holland and Belgium?

29. In which of these countries is butter made for export (i.e. to be sold in other countries)?

30. In which of these countries would you find people living in houses made of mud?

31. In which of these countries is water sometimes bought, and in which are irrigation canals important?

32. If a man in a savage community has a spare goat and needs a spear he must find some one who will exchange the one for the other. In civilized communities our spare property or our work is paid for with *money*, which can be exchanged for anything we need. What advantages has this latter method of exchange?

By courtesy of The Hudson's Bay Company

FIG. 41

Mrs. Black Bear out Shopping in Canada

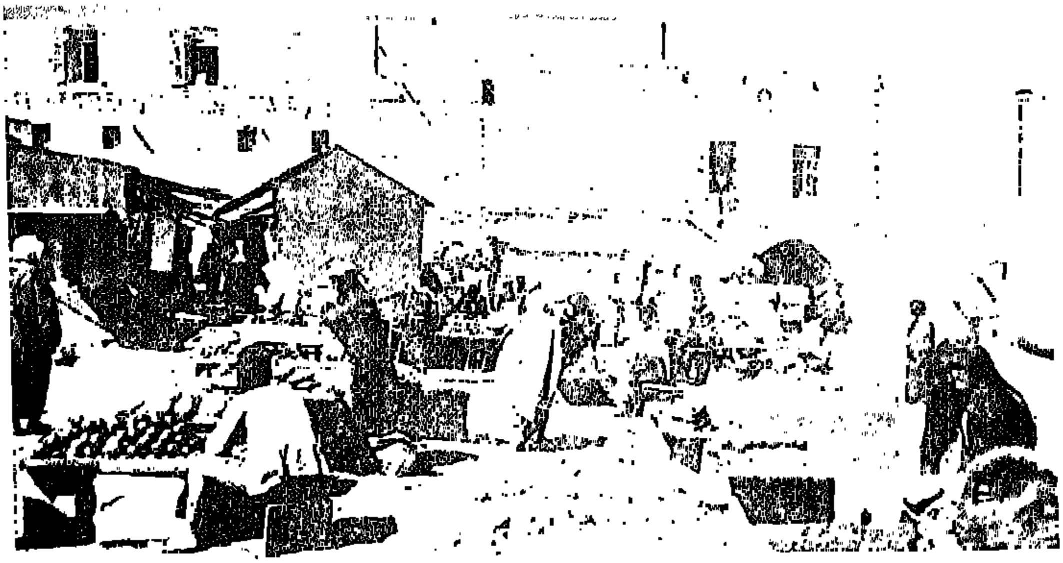
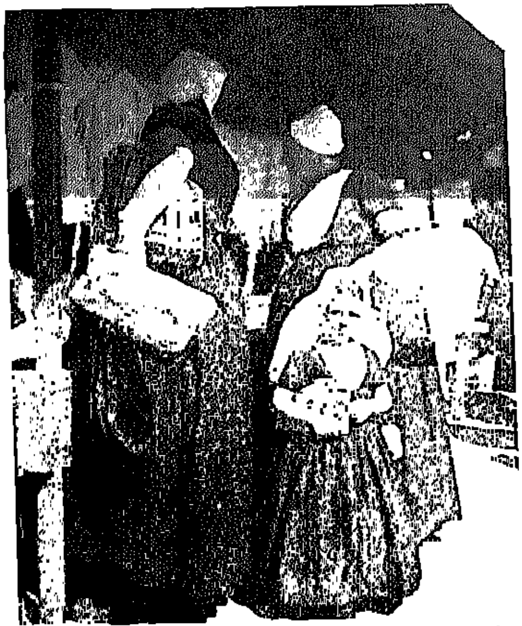


FIG. 42

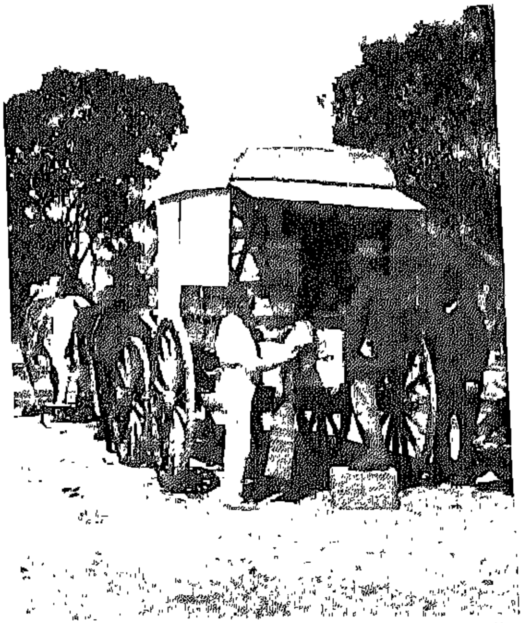
An Orange Market, in Syria



Kodak Snapshot

FIG. 43

Shopping at Middelburg, Holland



By courtesy of The High Commissioner for Australia

FIG. 44

Shopping in the Bush, Australia

FOUR DIFFERENT KINDS OF SHOPPING

OUTLINE ANSWERS

1. Going out to buy goods.

2. Money: this represents work or goods for which the money has been exchanged.

3. The grubs of various insects, which hatch out of their eggs in the spring. The bear has just awakened from his winter sleep, and there are no berries and nuts for him to feed on.

4. His labour, which consists in climbing the tree and scratching off the bark. He is doing the tree a good service by ridding it of some of the insects.

5. On the eastern coast of the Mediterranean Sea.

6. Large and sweet.

7. From Spain.

8. It is flat. This type of roof is commonly used in the East, for it provides the household with a private yet airy platform, where they spend the cooler part of the day.

9. Turks, Jews, and Arabs chiefly.

10. Palestine.

11. Stalls.

12. The Dutch.

13. Because most of their cattle are kept for dairy purposes and wood is cheaper than leather. Moreover it is less affected by water, an important consideration in the Lowlands.

14. "Out back," where towns are few and far between.

15. Tracts of land covered with shrubs, many of which grow to a great height. In some places it is still almost impenetrable.

16. It goes more quickly and, therefore, has to carry comparatively little fuel compared with the food necessary for the horse. The pedlar can cover a wider area and do more business in a lorry.

17. The horse and cart is less likely to break down, it can cross streams where there are no bridges more easily, and some food for the horse can be found growing on the way.

18. Steam power, which led to development of railways.

19. Less than a hundred years.

20. Market day.

21. In Canada (the Red Indians).

22. The Dutch peasant and the Australian farmer both get money for shopping by selling the products of their farms.

23. Most snow: Canada. Least snow: Syria.

24. On a tree.

25. Canada: English. Holland: Dutch. Australia: English. Syria: Arabic.

26. Arabic.

27. The donkey.

28. The dog.

29. Canada, Holland, Australia.

30. In Syria. Mud is useful for house-building in a hot climate where timber is scarce.

31. Water is sold in Syria at times. In Holland there are many canals to drain off surplus water, because the land is very low-lying; in Australia droughts sometimes occur, and irrigation works are being built to guard against the enormous loss of flocks and herds which have been the result of past droughts.

32. Goods can be bought more easily from *distant* markets. Less time and energy are wasted on selling and buying. Since people can do this more easily selling and buying increases. Money enables people to save more easily.

It is as well just to mention to Juniors that, though metal is the most common form of currency to-day, primitive peoples have made use of many things (e.g. shells) as a standard of value, and that in highly civilized communities various forms of paper (notes, bills, cheques, etc.) are used to represent large sums.

INDIA: A VAST LAND OF VIVID CONTRASTS

SPECIMEN QUESTIONS

1. What animal skins do you think are used in the scene shown on page 559?

2. How do the people actually get across the river?

3. Why do the peasants usually wear white clothes in hot countries?

4. Why is the picture of Bombay said to be a "contrast" to the one on the opposite page?

5. Say, in one word, what it is that makes Bombay so different.

6. What are docks?

7. What sort of vessels have you noticed at docks you know?

8. How does a ship show her nationality and her use?

9. Much of the land in the picture of Bombay is said to be "reclaimed." This means *taken back*. What from?

10. In what country very near England is similar work done?

11. There are some ships scattered about in the harbour on the right, and some in the docks themselves. Write what you think is happening on these ships.

12. Why do the people of India have brown skins?

13. When do you have a brown skin?

14. Do you know what this "brown" really is?

15. Notice that, though India is a hot country the peasants shown on page 559 wear plenty of clothes, including head-coverings and sleeves. Why?

16. Do you know the name of any Indian river?

17. On which coast of India is Bombay? (Find out from the map.)

18. Bombay is the centre of the Indian cotton industry. Judging by the picture on page 558, what sort of methods would you expect to find there?

19. Before the advent of machinery in Britain the household spinning was done by the unmarried girls and women. Remember, who did the spinning by hand: what English word comes from the word *spin*?

20. Has the Hindu language any kinship with English?

21. How have the people being ferried across the river placed themselves to balance the skins?

22. What would have to be carefully balanced in the case of a big ship?

23. What exactly does "an air view" mean applied to a photograph?

24. Why do the docks in the background look smaller than those in the front?

25. Would they look smaller in a plan?

26. What is the big difference between the ways in which the river craft in Simla and the steamers in the picture of Bombay are moved along?

27. What likeness is there between the two motive powers?

28. Draw from memory a rough map of the coastline shown in the picture of Bombay.

29. Why are there so many sheds in the picture of Bombay?

30. Find Simla in the map of India. Describe its position in a few words (use your ruler).

31. The number of people living at Simla at a certain season of the year is twice the ordinary population. Which season do you think this would be? Why?

32. How would the people shown in Fig. 46 ask for help if they got into serious difficulties while on the water?

33. How would help be summoned by a liner?

34. How do people generally cross rivers in England?

35. What does the Indian method of crossing the river suggest to you about the river?

36. If we had no bridge how would we probably cross a river?

37. When is it possible to walk across certain rivers?

38. It is possible to walk across the sea in two parts of the world for a similar reason. Where? Why in only two parts of the world?

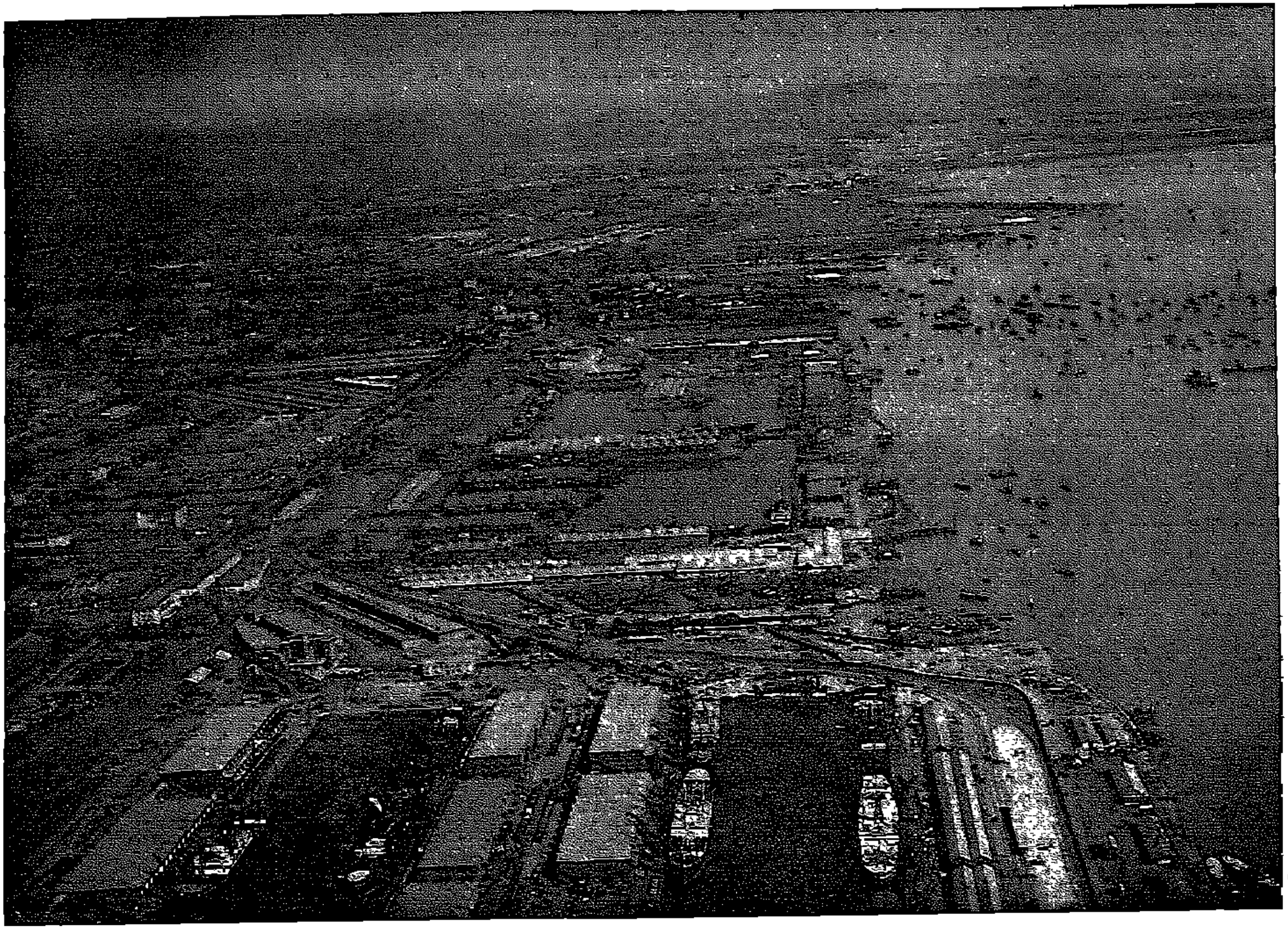


FIG. 45

Air View of Bombay Docks

(*Much of the land on which these buildings stand has been reclaimed in recent years*)

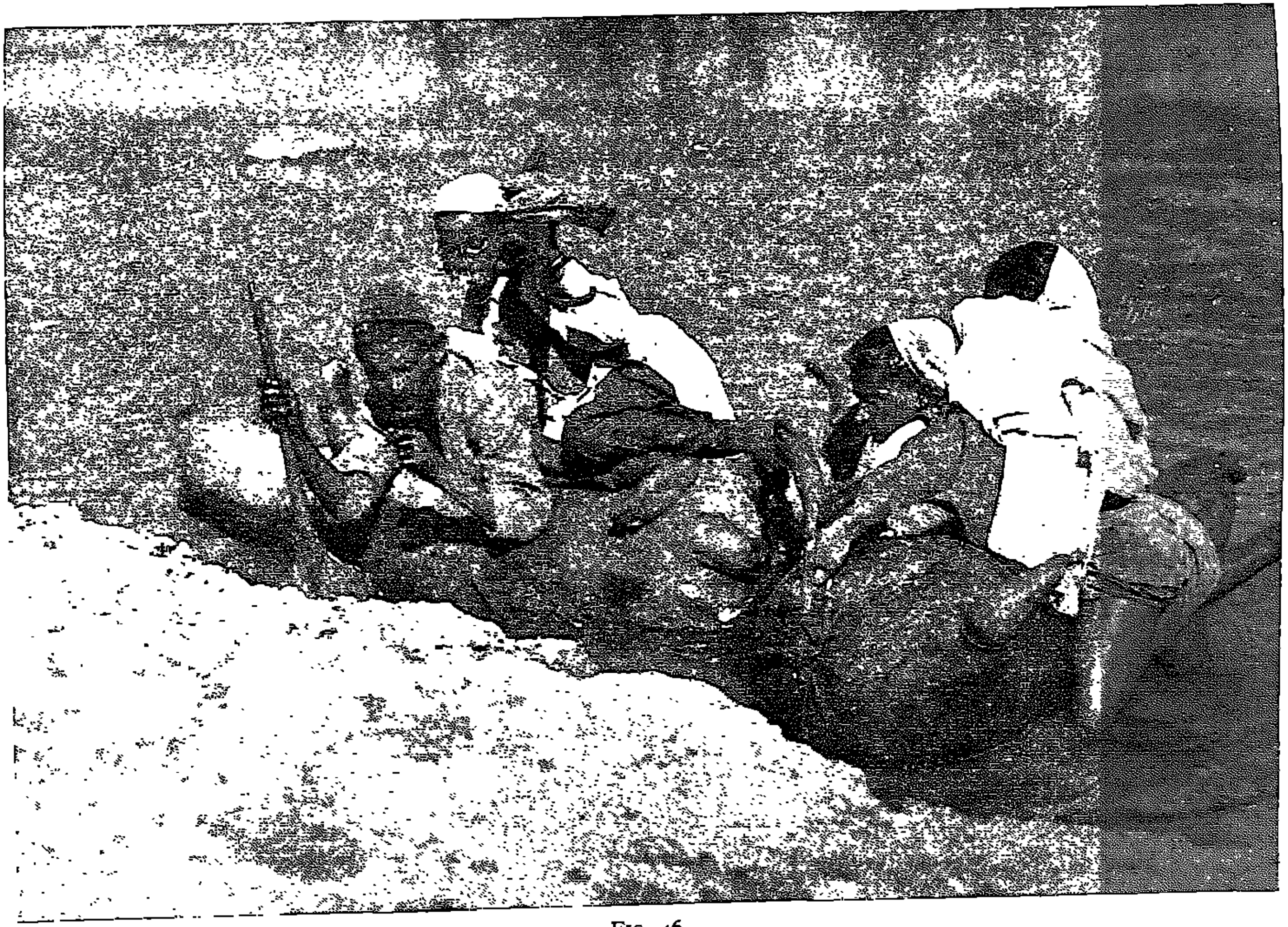


FIG. 46

Passengers Being Carried Across the River Over Inflated Skins : Simla Hills, India

INDIA: A VAST LAND OF VIVID CONTRASTS

OUTLINE ANSWERS

1. Bullock skins; this animal is the most common beast of burden in India.

2. By means of paddling. One man may be seen pushing off from the bank with the wooden paddle.

3. Because the colour white does not let the hot rays of the sun get through the material, but throws them back, so protecting the skin of the wearer.

4. Town as opposed to country; sea, instead of river; modern buildings; etc.

5. Machinery.

6. Docks are enclosures in harbours or on river banks, where ships are loaded or unloaded. *Dry*-docks are similar enclosures where the water is drained so that ships may be repaired.

7. E.g. cargo boats, passenger boats, tugs.

8. By the flag she is flying. British merchant boats carry the *red ensign* (red flag with Union Jack in upper quarter nearest flagstaff); the *blue ensign* (similar, but for blue ground) is carried by colonial vessels; British naval vessels fly the white ensign (banner of St. George with Union Jack in upper corner by the flagstaff).

9. The sea.

10. Holland.

11. Ships in the docks: loading and unloading, and repairs. Others, trading and pleasure (small boats).

12. Because of the hot sun.

13. In the summer time, and when exposed to sun and air.

14. A thin protective coating made by the blood to protect the blood vessels from too great heat.

15. Because it is cooler to wear plenty of clothes and *keep out* the fierce heat of the sun than it would be to wear less and have the sun beating down on the body. Remember the importance of covering the back of the neck, to avoid sunstroke.

16. Ganges, Indus, Brahmaputra, etc.

17. West coast.

18. Modern mechanical methods.

19. Spinster.

20. Yes, both the English and the Hindu languages can be traced back to an ancient Asiatic language called *Aryan*. The Hindus and most of the European peoples of to-day come from the Aryan race, which is believed to have lived long ago in Central Asia.

21. Somewhat in the form of a cross, in order to distribute the weight as evenly as possible.

22. The amount of water in the tanks which line the hull of a big ship.

23. A photograph taken from an airplane.

24. Because they are farther away from the camera.

25. No. They would be shown in their exact proportions, according to the scale used. (See "Home Geography," pages 357–360.)

26. Passengers are crossing the river in the Simla hills by the power of the man with the paddle; steamers move by the power of steam.

27. Both the energy of the man and the steam power are produced by means of a furnace, though of different types: the digestive system is a type of furnace, the fuel being food; oxygen from the air is used by the "burning" of the fuel in both cases.

28. This exercise could well be followed up by a memory drawing of India.

29. They are storehouses for the cargoes of the vessels. Bombay is an important port, and much cotton is exported from the docks here.

30. About 900 miles N.E. of Bombay.

31. The hot season. Because it is cooler up in the hills to the north of India than in the plains farther south, which are flat and also nearer the equator.

32. By shouting.

33. By wireless telegraphy.

34. By a bridge.

35. That it is not a very swiftly flowing river, and that it is free from crocodiles.

36. In a boat, which affords protection from the water—necessary in a temperate region.

37. When they are frozen.

38. The Arctic and the Antarctic. Only in these two regions, because its constant tidal movement makes it withstand freezing longer than other waters can.

RUBBER IN MALAYA: ON THE PLANTATION

SPECIMEN QUESTIONS

1. Rubber is prepared from a milky juice of *certain* trees, shrubs, and vines growing in or near the tropics. What is this sap called?

2. What is the name of the tree from which practically all rubber used for manufacture is obtained?

3. What is the native country of this tree?

4. What is the difference between the way the trees grow in the Amazon forest and in the *plantations* of Malaya?

5. What countries produce most of the rubber for manufacture to-day?

6. The rains in Malaya are very, very heavy. The soil of the rubber plantation is looked after carefully—manured, weeded, and so on. Can you think of a reason for the digging of pits and water channels?

7. Why is it necessary to clear the water channels?

8. Why is it necessary to drain the plantations of Malaya but not the Amazon forests?

9. What does the work of the rubber collector of the Amazon consist of?

10. What additional work is done in a plantation?

11. In which of these two places would more women be employed?

12. What is there in the picture showing upkeep of the plantation which has an Eastern appearance?

13. What does the collector do first?

14. What is his next action?

15. What can you learn from the clothes of the man who is tapping the rubber tree in Fig. 49?

16. What is the colour of the skin of the Malay race?

17. What other races are found in large numbers in Malaya?

18. What are weeds?

19. Which of the outdoor tasks on the plantation do you think needs most skill?

20. Name three manufactured articles in Fig. 49 which would probably have been imported from Britain.

21. What is the difference between an archipelago and a peninsula?

22. What important group of Islands is included in the Malay Archipelago?

23. What is the nearest continent to Malaya?

24. In flying from England to Australia an airplane passes over Malaya. Does it also pass over New Zealand? (Use the map.)

25. What made people first think of planting South American rubber trees in the East?

26. How can you imagine the Indians of South America discovering a use for rubber? (Christopher Columbus in 1493–6 found natives of Haiti using balls of rubber in their games, and Spanish troops waterproofed their garments with latex as early as 1615.)

27. Can you think of a reason why the life of the labourers on a rubber plantation is more healthy than that of the native collectors in the Amazon forests?

28. Name the most important range of mountains in each of the two continents to which Malaya and the Amazon region belong.

29. What name is given to a man who watches and directs work as the man in the background of Fig. 48 is doing?

30. Does the latex ooze out of the tree quickly or slowly, and for how long?

31. What useful juice is obtained from a tree of colder climates? (It is thought that latex may have a similar protective function, but the question of its value to the tree has not been finally answered.)

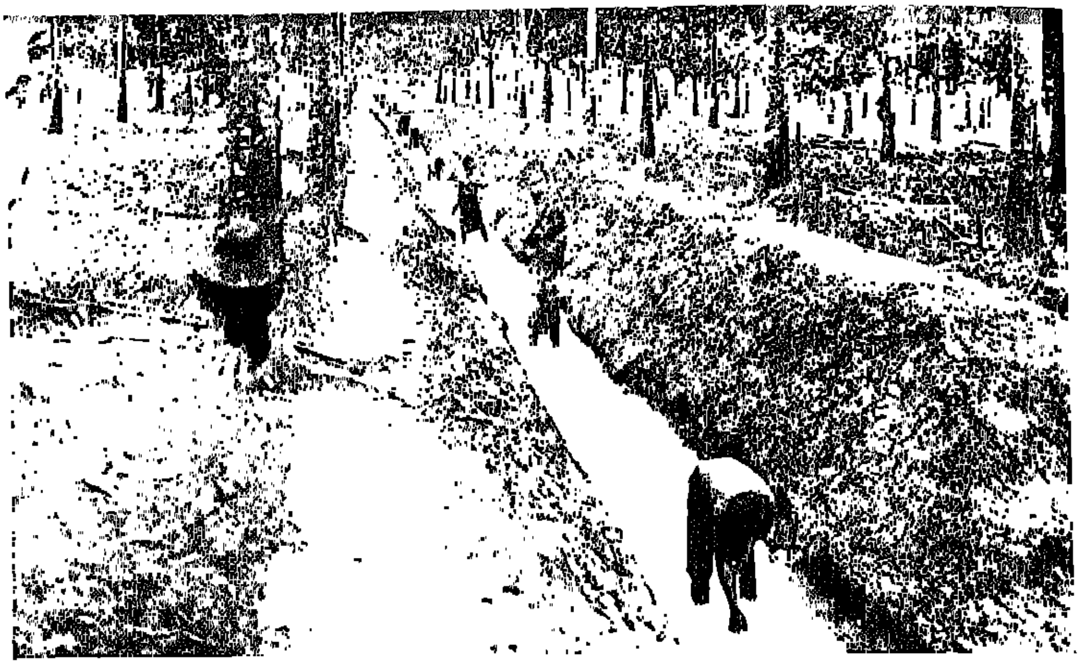
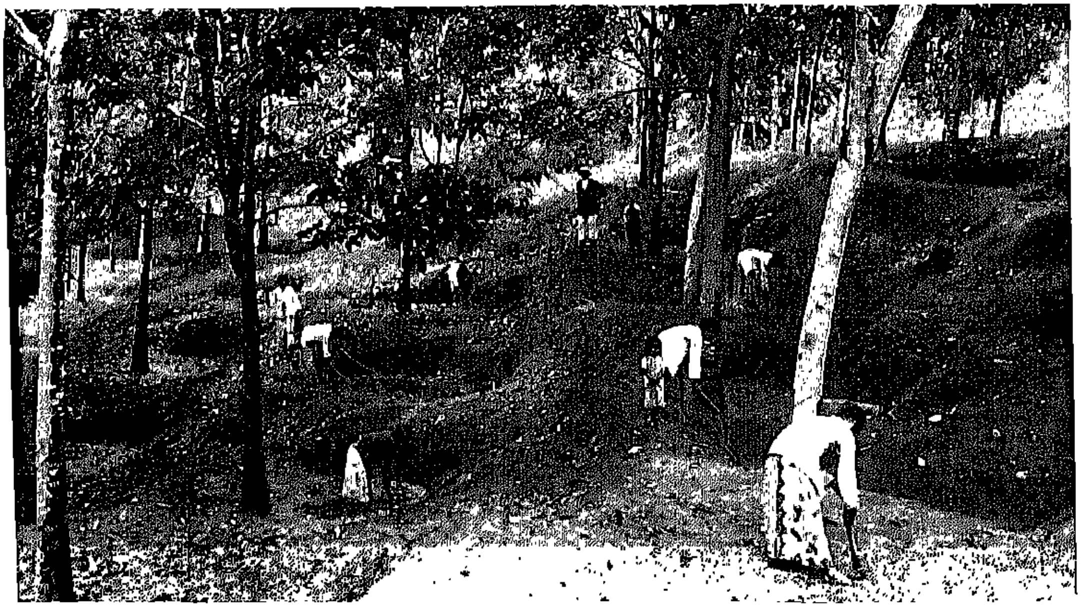


FIG. 47

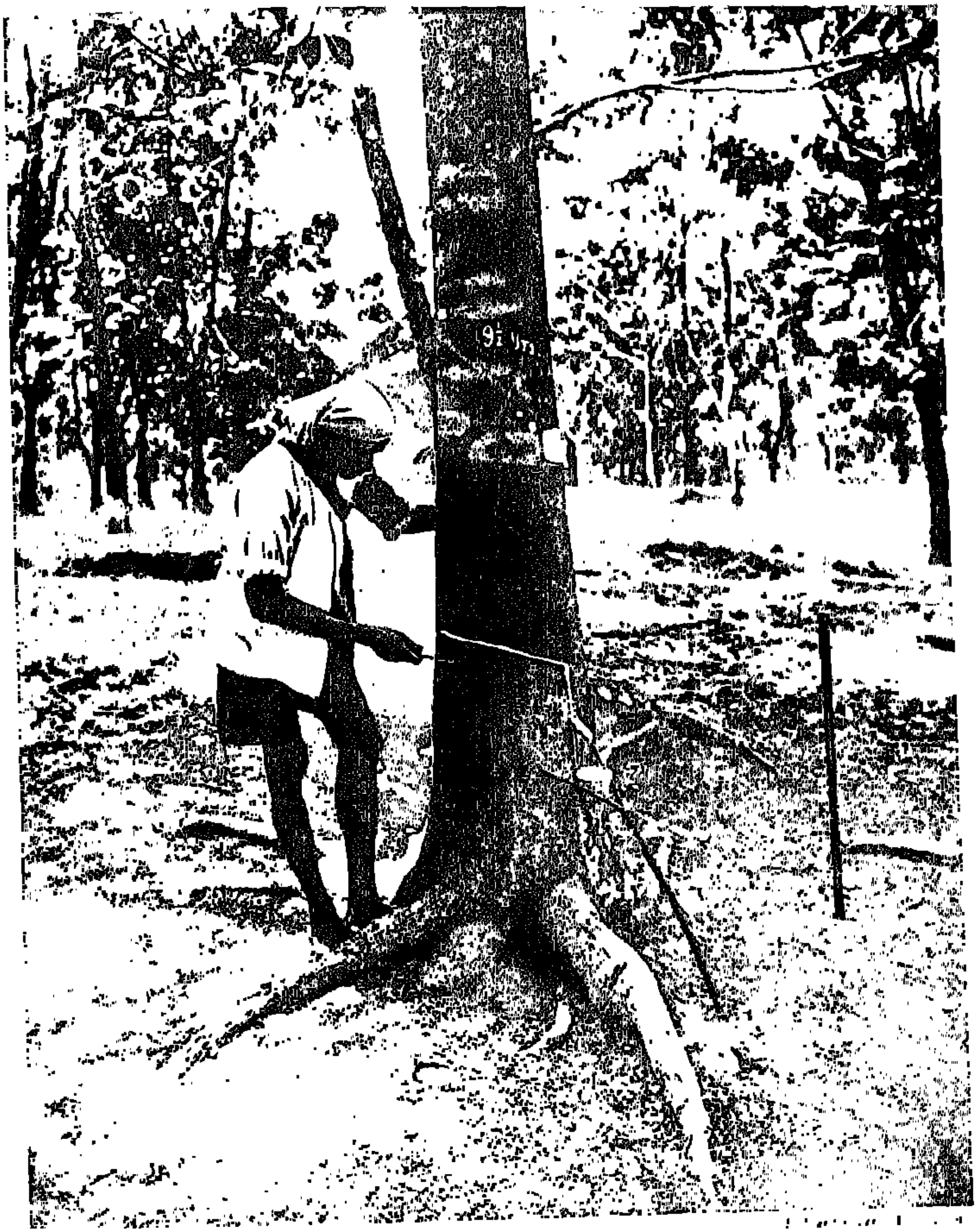
Clearing the Water Channel of a Rubber Plantation in Malaya



Photos by courtesy of *Rubber Growers' Association*

FIG. 48

Keeping the Plantation in Good Condition



By courtesy of

FIG. 49

How the Rubber Tree is Tapped in Malaya

RUBBER IN MALAYA: ON THE PLANTATION

OUTLINE ANSWERS

1. Latex. It is generally white, but occasionally yellow or slightly grey in tint.

2. The para rubber tree (Para is the name of a port in Brazil).

3. *The Amazon forest region* is the original home of the para tree.

4. In the Amazon forests the rubber trees grow amidst other trees, and there is dense undergrowth of shrubs and creepers. In a plantation the trees are carefully planted out in rows at certain distances apart.

5. Malaya, Dutch East Indies, Ceylon, Southern India, Brazil (Amazon), and Africa.

6. The rains wash away the valuable top soil, and if it were not for these hollows, in which the soil collects, the roots of the trees would be left uncovered. After the soil has settled to the bottom of these *sump pits* the water is drained off into the channels and the soil is easily put back round the the trees nearby.

7. Because the rains wash earth down into them, and the soil of the bank constantly slides down in small quantities.

8. In the Amazon region the roots of the innumerable plants of the forests hold the soil together, but in Malay plantations the forests have been cleared so that the rubber trees may have all the nourishment from the soil.

9. Tapping the trees for latex, collecting this, and drying it so that it can easily be transported.

The South American Indian makes a special conical clay oven, builds up a fire with certain palm nuts which give off great quatitnies of smoke, then dips a 6 ft. long "paddle" into the rubber and holds it in the fire until the thin coating of rubber is dry. Then he again dips it into the latex, and another coating is dried, and this goes on until he has a large ball; when this is cut in two to release the stick, the halves are called *biscuits*.

10. In a plantation the soil is carefully treated, the seedlings are raised in a "nursery," and planted out with a clear space for each one, water channels are made and kept in good condition, and at the factory on a plantation the latex receives much better and more complicated treatment. European methods and machinery promote greater cleanliness, which improves the quality of rubber.

11. In the plantation.

12. The dress of the women.

13. He makes a slit in the bark of the tree, sometimes V-shaped, sometimes, as shown in Fig. 49, a straight cut a quarter of the way round.

14. To fix the cup of earthenware or aluminium below the slit.

15. That he is in contact with white men, and that he works in strong sunshine (head and neck protected).

16. A light brown.

17. The Chinese and the people of Ceylon and Southern India (*Tamils*).

18. The wild plants growing where man finds them useless or undesirable are called weeds.

19. Tapping the trees. Tamils are employed especially for this work.

20. The man's jacket, his knife, and the metal cup for the latex.

21. An archipelago is a sea with many islands scattered in it. A peninsula is a piece of land which is not quite an island, being joined on to the mainland on one side.

22. The East Indies.

23. Australia—Malaya is in Asia.

24. No—New Zealand is the other side of Australia.

25. British buyers wished to found British source of supply. Wild rubber grew in the East, but was inferior to para. Seeds were obtained from South America and British plantations founded in the nineteenth century.

26. By accidentally cutting one of the trees and from curiosity touching the latex.

27. Because air and sunlight penetrate through the trees in the plantation, but in the jungle of the Amazon the vegetation is too thick to allow this, and it is damp, airless, and hot.

28. The Himalayas of Asia, Malaya, and the Andes of South America (" the Amazon region ").

29. The overseer.

30. Slowly, and for less than an hour.

31. Pine resin.

RUBBER: FROM MALAY PLANTATION TO BRITISH FACTORY

SPECIMEN QUESTIONS

1. How is the rubber brought in to the plantation factory?

2. The latex is brought into the factory by natives, and pailfuls from groups of trees are tested with a *metrolac* to see how much rubber they contain. This is noted in a book, and thus it is known which parts of plantation need manuring, weeding, etc. Who tests the latex and records the results?

3. What is the white man's sun-helmet called?

4. Which would it be possible to carry in greater quantities at a time, water or latex?

5. Can you think of any quicker method of collecting latex?

6. How is the latex turned into the sheets of rubber shown in the lower picture?

7. Is smoke used to dry all rubber on a plantation?

8. Why is the latex generally made into rubber before shipping it to other countries?

9. Why is india-rubber so named?

10. After the rubber is rolled into thin sheets and dried it is packed into cases for transport. Do you think these sheets remain as separate sheets throughout their long journey to another country?

11. In what other country do boats have a shelter over them?

12. Why is this necessary?

13. How has the rubber in Fig. 52 been brought down to the port?

14. What trees can you see in this picture of Malaya?

15. Why do the leaves of this tree split up into the feathery type of leaf you see in the picture?

16. A white man in a sun-helmet is standing among the natives as they carry the cases of rubber into the store. Is he only watching them?

17. How is the rubber brought to Great Britain?

18. To what ports in Britain does the rubber from Malaya come?

19. When the rubber reaches the British factory there are many different treatments which it may undergo. What decides the particular form of treatment?

20. In the picture of the British factory you can see a great deal of machinery. How would the picture be different if there were less machinery but the same amount of work had to be done in this room?

21. Machinery takes away a good deal of manual work from the men in the factory, but how does it make more work?

22. What have most children owned which came from the Sorbo factory?

23. Do all rubber manufacturers use the same ingredients for making rubber articles?

24. More and more uses are being found for rubber. Can you see why this is affected by the fact that more rubber is being produced than the world is willing to buy?

25. Name three things for the bathroom which may be made of rubber.

26. Name three things for a motor-car which may be of rubber. (The motor industry uses about three-quarters of the world's total consumption of rubber.)

27. What are macintoshes, and why are they so named?

28. What toys are made of rubber?

29. How is rubber made to look attractive?

30. Such discoveries as methods of making use of rubber have great effect on our daily lives, dress, etc. What is one very useful form of rubber used in braces and garters?

31. How is water obtained for the factory (*a*) in Malaya, (*b*) in Britain.

32. Are the owners of a factory the only people who make rules as to how the work shall be carried out?

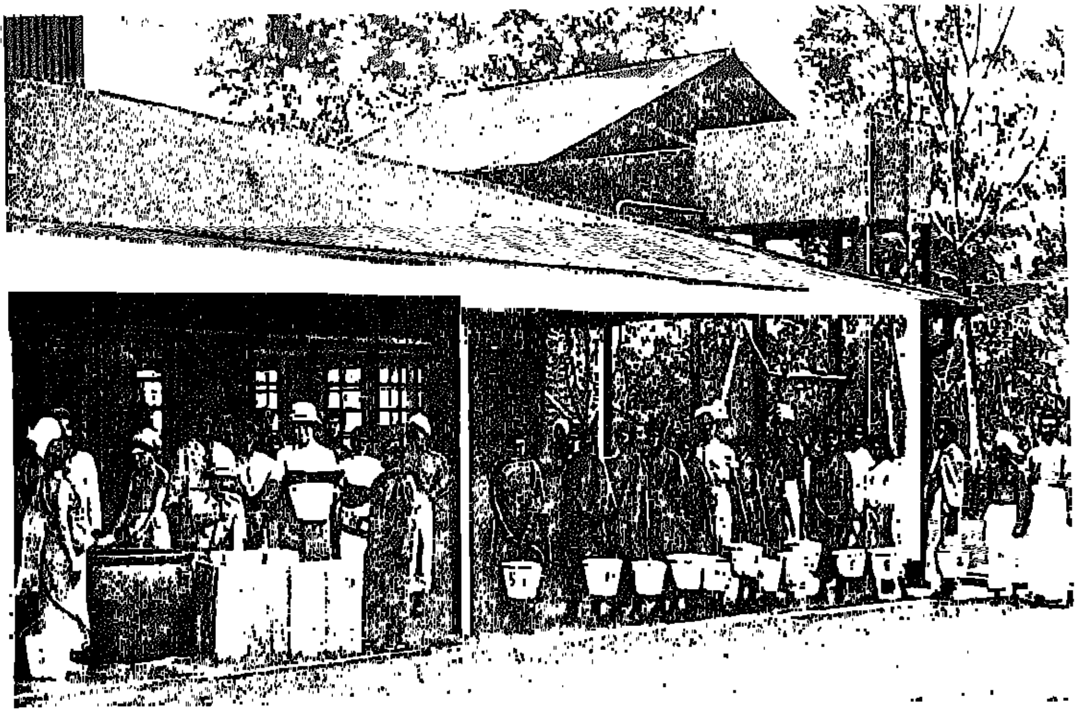
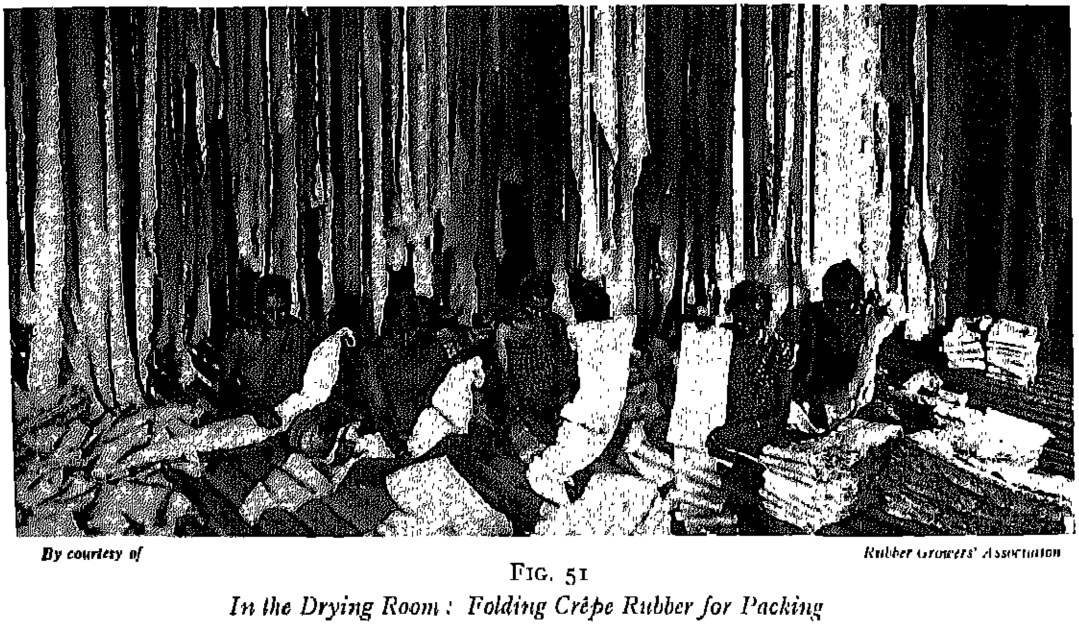


FIG. 50

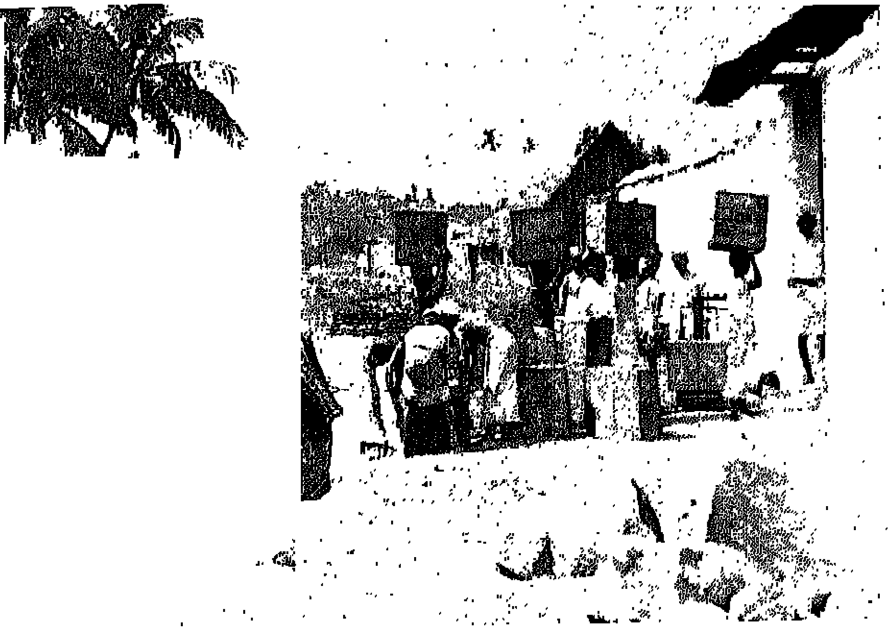
Bringing in the Latex to the Factory in Malaya



By courtesy of *Rubber Growers' Association*

FIG. 51

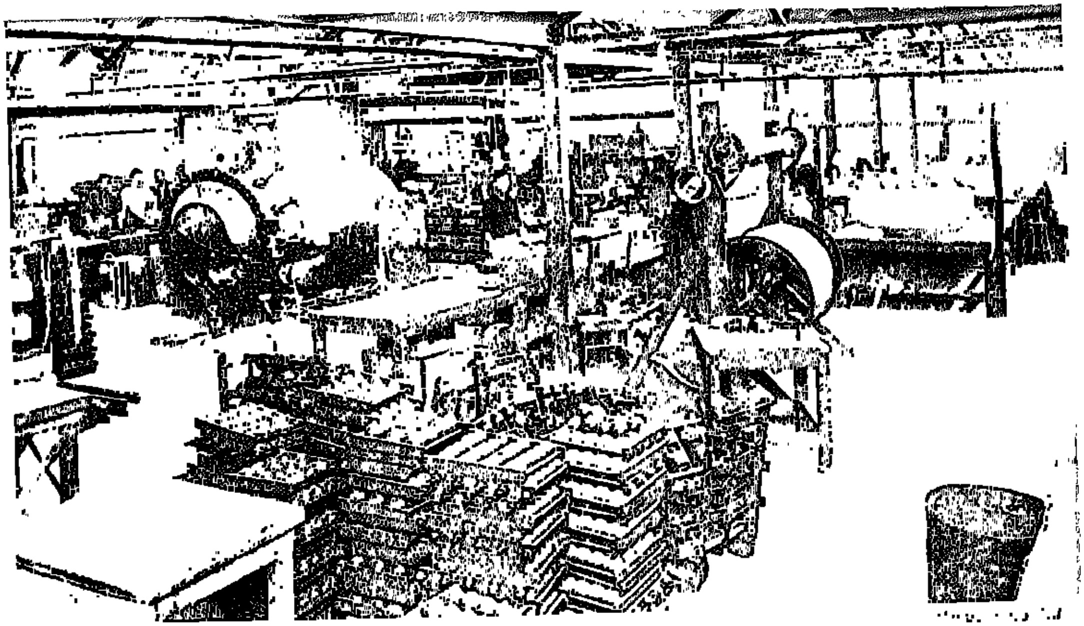
In the Drying Room: Folding Crêpe Rubber for Packing



By courtesy of Rubber Growers' Association

FIG. 52

Putting Cases of Rubber into Store to Await Shipment



By courtesy of [illegible]

FIG. 53

The Factory in Britain

RUBBER: FROM MALAY PLANTATION TO BRITISH FACTORY

OUTLINE ANSWERS

1. It is collected into pails.

2. White men (see Fig. 50).

3. A topi or topee.

4. Latex. The latex is water with particles of rubber dissolved in it, and these are lighter than water, and rise to the top, like cream.

5. Taking a big collector round the plantation. In some plantations bullocks draw carts, on which a tank is fixed, round the field to certain points, where they are met by the collectors with their pailfuls of latex.

6. It is put into a big tank in the factory, and certain chemicals are stirred into it. Sheets of thin wood are fitted across the tank so that the rubber settles between these into sheets of jelly-like consistency. These sheets are then rolled to take out water, and for some kinds of rubber they are sprayed with water, as they are rolled, to take out dirt. After being rolled a number of times the sheets are quite thin.

7. No. Some rubber is hung in long sheets and the drying room is then filled with smoke. Other types of rubber are just hung up and left to dry.

8. If the latex is shipped in tanks the water is taking up a great deal of room and costing a great deal of money. This is worth while only to the few manufacturers who work with the latex and eliminate the processes described above.

9. Because one of the first-known uses of rubber was as an eraser, and in those days India was the only British source of supply.

10. Owing to the warmth produced by the tight packing in the cases the rubber becomes a solid mass by the time it has travelled overseas. It is later *vulcanized* so that heat does not affect it.

11. In India (see Chart "Rice in India").

12. To protect the passengers from the sun.

13. By water, the cheapest method of transport.

14. Palm trees.

15. Because these trees are very tall, and large flat leaves would "catch" the violent winds which blow at certain times of the year.

16. No. He is entering into a book particulars of the packages (see marks on cases).

17. By ocean liners.

18. To London and Liverpool (Liverpool took it all in the days when all rubber came from America, but, though it has a good deal from Malaya, London also receives large quantities).

19. The type of article into which it will be made. The treatment at the Malay factory counts also, for crêpe rubber for shoe soles, for instance, is not smoked and comes over in thicker sheets than the rubber which is intended for inner linings of motor tyres.

20. There would be more men and women.

21. It makes work for the men who make the machinery, and also for the people who organize the sale of the products. Machinery enables production to be greatly increased and there is, therefore, a great deal more to do in selling all these goods, advertising, etc.

22. A ball of solid rubber which bounces well is only one of the many products of this firm.

23. No. Each firm has its own particular "patent" formula in regard to amounts of various chemicals, etc., added to the rubber.

24. When the buyers find that the manufacturers do not need as much rubber as they are producing they employ men to find out new ways of using their product.

25. Mat for the bottom of the bath to prevent slipping, rubber sponge, soap-holder, floor covering, door stopper, anti-plash fixture for tap, washer for tap, etc.

26. Inner and outer tyres, mats.

27. Material coats coated with rubber to keep out rain. (Named after inventor of process.)

28. Balls, animals, dolls, balloons.

29. By colouring it.

30. Elastic.

31. In Malaya by artesian wells worked by wind pumps (see Fig. 52). A tank may be seen outside the factory in Fig. 50. In Britain the water is obtained from great reservoirs.

32. No. The Government and trade unions enforce certain rules for the good of the workers.

COAL AT CARDIFF

SPECIMEN QUESTIONS

1. Where is Cardiff?

2. What is the name of the coal-field which supplies the coal which Cardiff exports?

3. What was the coal-field thousands of years ago?

4. How did it become a coal-field?

5. What railway transports most of the Welsh coal?

6. Whose names may be seen on coal trucks?

7. How is the coal put on board ships?

8. For what two purposes are ships loaded with coal?

9. Which of the crew have work closely connected with the coal used as ship's fuel? What are their respective duties?

10. Why do ships carry wireless apparatus?

11. What is the man called who has charge of the ship's wireless?

12. In which of these pictures can you see something connected with telegraphy?

13. What two chief kinds of docks are there?

14. Why are docks necessary?

15. When a boat is chartered to carry coal abroad from Cardiff does it return straight away?

16. How do the coal trucks get to the quayside?

17. What is that part of the ship called where the coal is stored which is to be used as fuel?

18. What is the name of the part of the ship where the coal is carried as cargo?

19. Where does this part of the ship lie?

20. Why, in a big ship, is the space allowed for cargo divided into several holds, one above the other?

21. Why are the ships waiting in the middle of the dock?

22. Is Fig. 56 a picture of a wet dock or a dry dock? Give reasons for your answer.

23. What is a vessel called if it is employed in carrying cargo round the coast?

24. Oil is used for some big ships to-day. In what two different ways is it used?

25. For what use is the South Wales coal particularly suited?

26. Why cannot wood be used as fuel for ships?

27. What use is made of coal other than as fuel?

28. What three kinds of power are in use at Cardiff dock?

29. What river is Cardiff on?

30. Into what sea does this river flow?

31. What part of North America is nearest to Cardiff?

32. For how many centuries has the eldest son of the King of England been called the Prince of Wales?

33. What well-known folk stories of a king and his knights were written down by a Welshman, Geoffrey of Monmouth, in the twelfth century?

34. Why must the bottom of a ship be scraped regularly to remove the tons of seaweed, barnacles, etc., with which it has become coated?

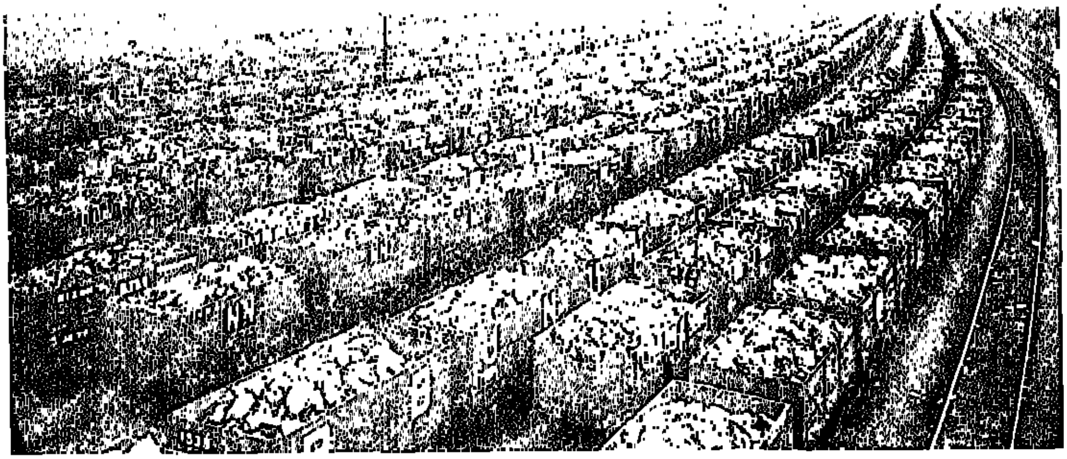
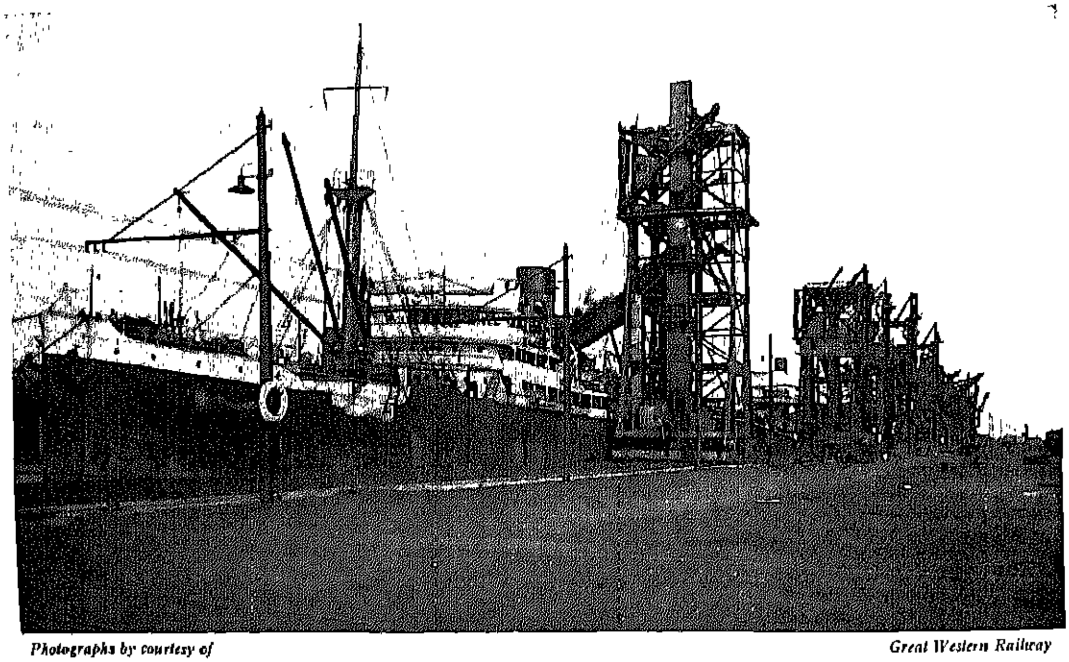
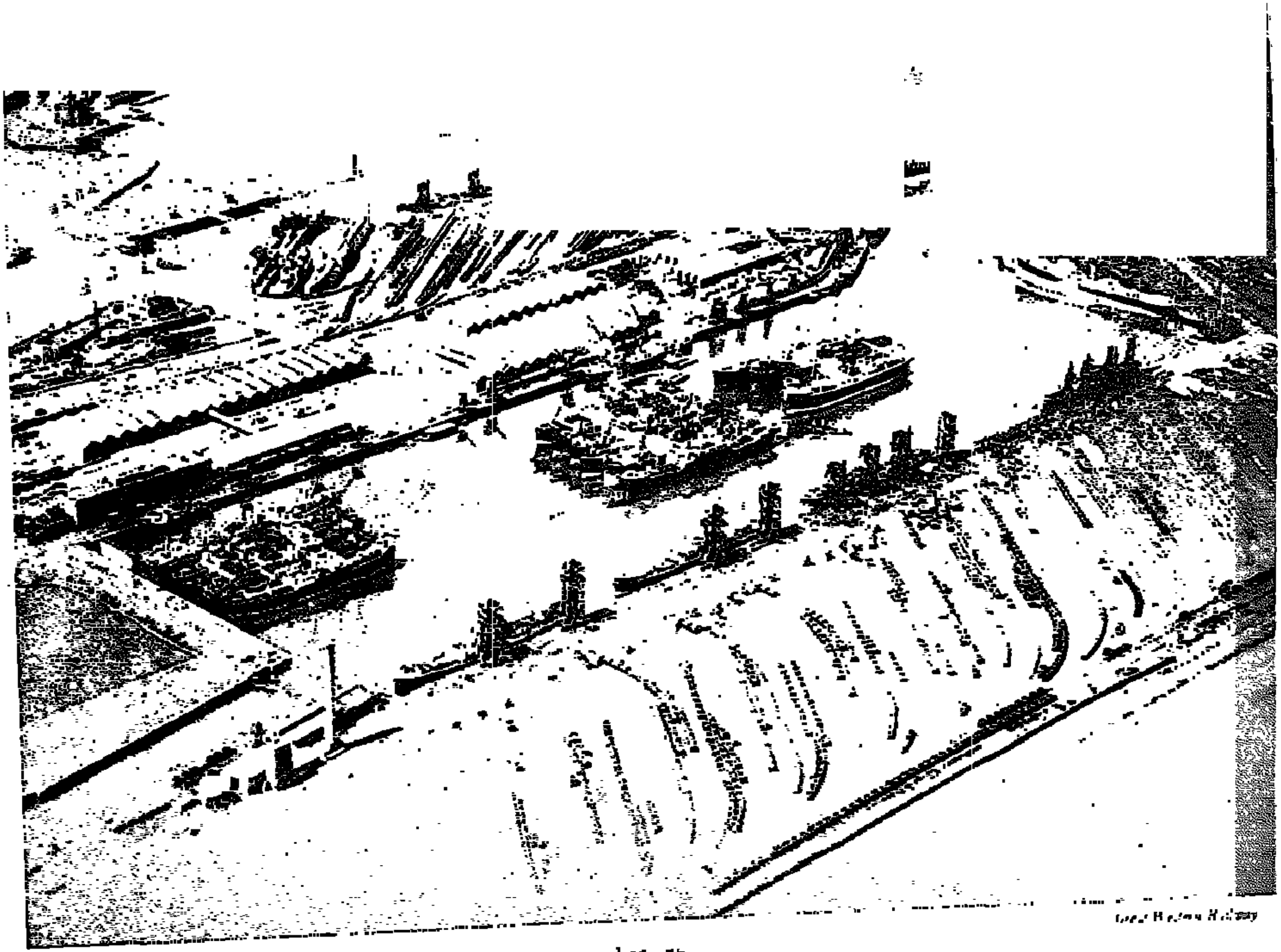


FIG. 54
Trucks Laden with Coal in Railway Siding, Cardiff



Photographs by courtesy of *Great Western Railway*

FIG. 55
Shipping the Coal by Hoists at Cardiff Docks



By courtesy of Great Western Railway

FIG. 56

An Air View of Bute Docks, Cardiff

COAL AT CARDIFF

OUTLINE ANSWERS

1. In south-west Wales.

2. The South Wales coal-field.

3. A forest of great trees.

4. Upheavals in the earth's crust resulted in the burial of these forests deep down in the earth. The enormous pressure lasting for thousands of years has made the trees into the hard black substance we call coal.

5. The Great Western.

6. Name of the railway carrying the coal, of an agent who buys "in bulk" (a middleman), of the colliery, or of a coal-merchant.

7. By special "hoists." These stand on the quayside beside the railway. The truck is taken up in the hoist to the necessary height and the coal is then tipped out of the truck into a shute, which carries it into the ship.

8. (1) To provide them with fuel for making the steam which carries them along. (2) So that they may carry it to customers either in other parts of England or abroad.

9. The firemen and the trimmers. Firemen shovel coal into the furnace. The trimmers must see that a stream of coal is constantly trickling down to the hatches by the firemen. Also, when coal is being loaded on to a ship the trimmers see to its distribution. The point of the shute is placed in the hold as they direct, and with shovels and flat steel-faced pieces of wood called "telegraphs" they fill up the farther corners of the hold and spread the weight evenly, to help balance the ship.

10. So that they can give and receive messages. These may include directions as to coming into and leaving harbour, S.O.S. calls in case of accidents to the ship or illness of the crew, messages to be passed on, etc.

11. The wireless operator.

12. Fig. 54: telegraph poles and wires. Fig. 55: ship's wireless aerial.

13. Wet docks, where ships load and unload, and dry docks where repairs are carried out.

14. *Wet Docks.* In these the water is kept at a certain level by means of gates so that the ships are not affected by storms and the coming and going of the tide. *Dry Docks.* The bottom of a ship cannot be repaired while the ship is surrounded by water. In the dry dock the vessel is supported by blocks and the water is then drained off.

15. No. It picks up another cargo at the place where it discharges the coal, and may have been round the world before coming back to Cardiff. Most boats of this type are "tramps," and their various cargoes and destinations are arranged at the head office of the shipping company that owns them.

16. The rails run from the main line right to and alongside the quay.

17. The bunkers.

18. The hold.

19. On each side of the bunkers—"fore and aft"—between the decks.

20. Because it would, with most cargoes, ruin that which was packed at the bottom if the weight of all the remainder rested on it.

21. Either for the dock gates to be opened so that they may leave the dock, or else for a space to be free alongside the coal hoists.

22. A wet dock. Note: the reflections of the boats and of objects on the quayside; coal elevators for loading; ships grouped together.

23. A coasting vessel.

24. (i) As fuel to heat the boilers; or (ii) in the same way as it is used in a motor-car (internal combustion engine—no steam).

25. For fuel for ships because it burns slowly and gives out great heat (Naval Steam Coal).

26. Because it burns up so quickly that it would not be possible to carry sufficient to last a voyage.

27. Coal-gas used for lighting and cooking is prepared from coal, and there are a large number of *by-products*, e.g. coal-tar, coke, benzene.

28. Hydraulic, steam, and electric power.

29. The Severn.

30. The Bristol Channel.

31. Newfoundland.

32. For six centuries—(the Black Prince).

33. The stories of King Arthur.

34. Because carrying this weight wastes fuel and slackens speed.

THE NATION'S MARKETING

SPECIMEN QUESTIONS

1. Why are the barges in Fig. 57 alongside the ship?

2. How is the ship kept steady by the wharf?

3. What machines are used to unload and load ships?

4. By what power may these be worked?

5. What work in connection with loading and unloading is done by men on the wharf?

6. What do tugs do for big ships?

7. Why are they necessary?

8. What can be seen on the sides of the ship at the *bows* (the forward part of the vessel).

9. What is the back part of a boat called?

10. What name is given to the rope or chain which connects the ship and its anchor?

11. By what power are tugs driven?

12. Have you ever watched tugs on a river? What are they used for besides towing big ships?

13. What is the most important cargo brought into the Manchester Ship Canal?

14. Is there any one import equally as outstanding in the case of London?

15. What is a fire-float?

16. Why is this type of boat necessary?

17. Where do the firemen in the float get the water for their hose?

18. What famous bridge is to be seen in the background of the picture of firemen at practice?

19. Why do children like to watch big ships passing under this bridge?

20. Of what country is London the capital city?

21. What are the buildings along the bank of the river shown in Fig. 59?

22. What is that part of the Thames just below London Bridge called?

23. How is the air kept fresh inside a ship?

24. What important mark is to be seen on the outside of each side of the hull of every British ship, and what is this for? There are two lines marked W. and S., for winter and summer.

25. When the captain brings a ship into dock to whom does he have to report his arrival?

26. Does the tidal movement of the sea affect the Manchester Ship Canal and the River Thames?

27. Is the unloading and loading of a vessel carried out by a ship's crew?

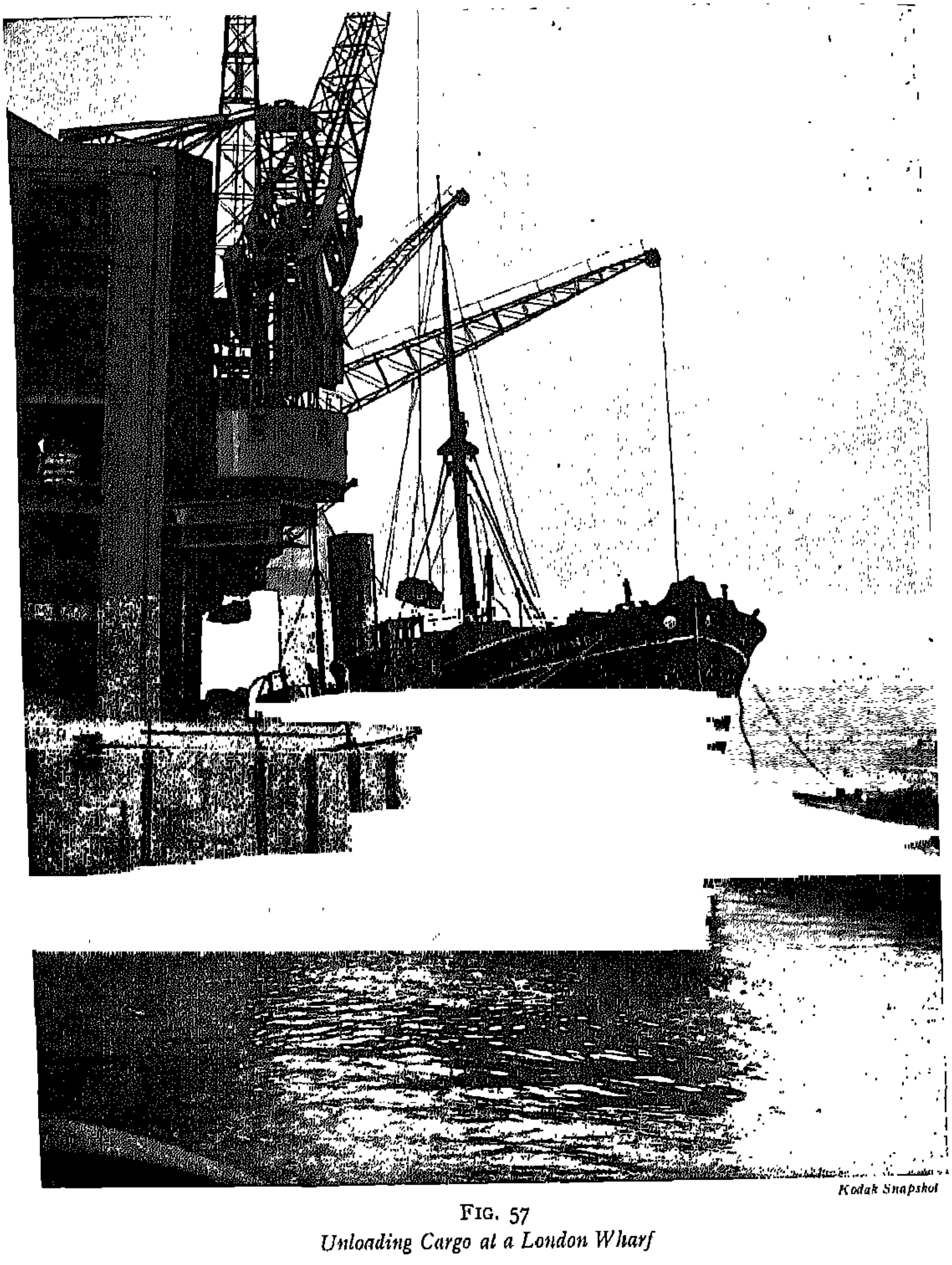
28. Why is it that a fire can be put out with water?

29. What are the most important Thames bridges.

30. By which of the Thames bridges in London is a fire-float stationed?

31. What are used to make the hull of a ship? (Inside a big ship there is a framework of girders such as may be seen when a big building on land is in progress.)

NOTE. *Hydraulic power as applied to lifts and cranes may be simply described to Juniors as the mechanical filling and emptying of water tanks which are attached to the lift or crane by cables passing over pulleys. As the tanks fill, the weight of the water lowers them and the lift or crane is pulled upward As the water is emptied out they rise and the attached object is lowered.*



Kodak Snapshot

FIG. 57

Unloading Cargo at a London Wharf

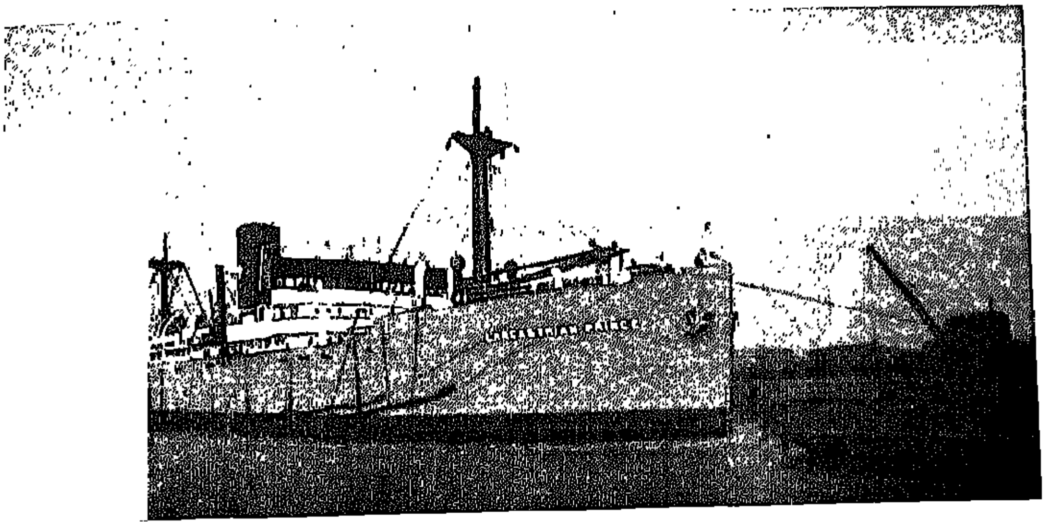
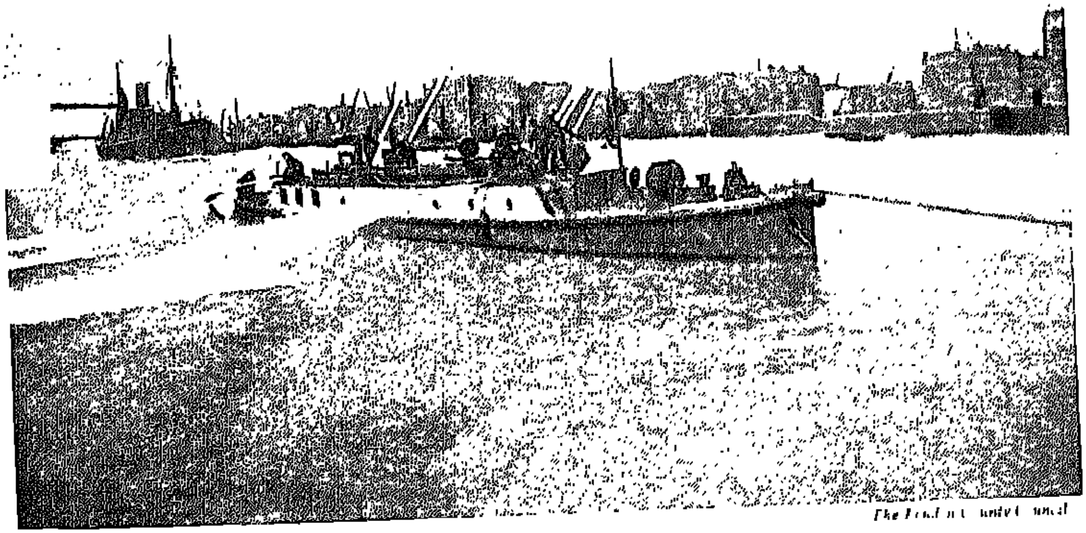


FIG. 58

Tugs Towing a Ship through the Manchester Ship Canal



By courtesy of *The London County Council*

FIG. 59

Fire-float Practice on the Thames

THE NATION'S MARKETING

OUTLINE ANSWERS

1. They are waiting to take off some of the cargo which has to be delivered higher up the river.

2. By an anchor and by mooring ropes fore and aft.

3. Cranes are used for the bulk of the cargo. The smaller type of crane, called a derrick, is used for smaller loads which have merely to be swung on to the landing-stage or the barges.

4. By hydraulic (water), steam, or electric power, nowadays generally the last-named.

5. Men rope the loads together or place them in a net, and attach them to the hook of the crane by chains or ropes; men on the wharf detach the loads from the crane and take them away on trolleys.

6. Tow big ships on rivers or canals.

7. A big ship will not respond to the tiller unless the engines are running at high pressure. Only the middle channel and the water by the wharves are dredged and the ship must be slowly and carefully guided on its way amidst other shipping. Moreover, the wash set up by a big ship would interfere with other boats.

8. Anchors. Notice in Figs. 57 and 58 the shape of the modern anchor.

9. The stern.

10. The cable.

11. By steam power.

12. Tugs tow barges on rivers or on coastal trips.

13. Cotton.

14. No. London's importance has been based on the navigability of the Thames for centuries. Before the discovery of the New World practically all Britain's overseas trade came from the Continent and in those days the wealth of England was chiefly in the agricultural south, so that London was the centre of most foreign transactions. Consequently London docks have always been among the best in the world, and numbers of industries have markets and buying agencies in London.

15. A boat fitted up as a fire engine.

16. Because a land engine could not deal with fires on ships in mid-river. Also they are useful in cases of riverside fires.

17. From the river.

18. Tower Bridge.

19. Because to allow the passage of big ships the bridge is cleared of all traffic, and the two halves are raised on hinges by hydraulic power.

20. England.

21. Warehouses for storing cargo.

22. The Pool of London.

23. By means of the curved ventilator pipe on the deck which may be seen in Figs. 58 and 59. These may be turned round so that they catch whichever wind is blowing.

24. The Plimsoll Mark. When the boat is so loaded that this line is at the water level no more cargo must be taken on board as the ship could not be relied on to travel in safety.

25. To the office or agents of the company owning his ship and to the Customs officials; the latter inspect his cargo to see that it is correctly described in his papers and does not include forbidden goods.

26. The Manchester Canal is *not at all affected* by tides but the Thames as far as the outskirts of London is affected by the tides of the North Sea and the English Channel.

27. Members of the crew do the necessary work on the ship itself, but labourers are employed for the wharf work by the owners of the wharf. This is one of the reasons why payment has to be made to the wharf owners.

28. Because the water keeps air from the flames, and air is necessary to burning.

29. Starting from the east—the Tower, London, Southwark, Blackfriars, Waterloo, Hungerford, and Westminster Bridges.

30. By Blackfriars Bridge.

31. Steel plates. (It would be well to mention that whatever power is used on a ship is required to turn the *propellers*.)